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ORIGINAL COMMUNICATIONS.

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EXPERIMENTS WITH RADIUM IN SOME NOSE, THROAT AND EAR DISEASES.*

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Ever since the wonderful discovery of the X-Ray by Roentgen, and shortly after by the scientific evolution of the same by Tesla, Edison and others, considerable interest has been awakened in the scientific, particularly the medical, world in photo and radio-therapy. X-rays, Finsen rays, Minin light, sun rays, high frequency current and radium rays have had their therapeutic application sufficiently tested that one can make a fair comparison as to their value. Like all new discoveries, the various rays have been taken up with considerable enthusiasm, and consequently a large amount of literature is already at hand, with controversies as to the successes and failures. Some of the literature and report had better not have been published for the good of the ray treatment, as the reports of some men are either from poor observation or not entirely honest.

From my collection of authenticated cases reported, I should place the various rays in the following category as to their therapeutic value: First, X-Ray; second, Finsen light; third, Minin light; fourth, high frequency; fifth, radium; sixth, sunlight.

This classification may not be entirely correct, particularly so far as the radium is concerned, because its radio-active property is shown to be far superior to any of the other rays, but from the practical or clinical standpoint up to the present time it has not found a place near the top. It is an established fact that the radium rays mention-

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ed cannot be deflected or broken in any way except by a magnet, but that they travel in straight lines; also a clinical fact that the best action of radium rays is obtained if they can come directly in contact or as nearly so as possible with the pathological tissues. This fact places radium as the most practical radio-active substance for treatment of pathological conditions in cavities as, for instance, the ear, nose and throat, which are not so easily accessible with other ray apparatus, such as the X-Ray tube, Finsen or Minin lamp.

About the same time that Roentgen made his discovery known, physicist H. Becquerel reported that uranium had the same properties of radiation as the X-Ray, but spontaneously, that is, without the aid of an electric current.

This discovery gave an impetus to the scientists, and they proceeded to find substances that contained uranium in greatest quantity. They found that the pitch blend, particularly that found in Joachimstahl, Bohemia, was the richest in containing radio-active substance. Professor and Madame Curie, of France, and at the same time, independent of them, Prof. Giesel, of Germany, obtained a large quantity of this pitch blend, and produced from it a substance highly radio-active. This in honor of the birthplace of Madame Curie was named Polonium. This substance was soon discovered not to be absolutely pure, so the Curies experimented further until they obtained the real article, which they called radium. Radium belongs to the Barium group, and its rays are about two million times as intense as the rays of uranium, or Thorium. Radium as used in medicine is in the form of a salt, either bromide or chloride, and is a white, fine powder contained in hermetically sealed tubes of either glass, rubber, aluminum, celluloid, or mica. The action of the radium is by, first, its rays; second, by its emanations, and it has the property of luminescence and giving off heat. Three distinct rays are described as given off from radium with three distinct activities, called *Alpha*, *Beta*, and *Gamma* rays. The Alpha rays or first group of radiation carry a charge of positive electricity and appear to be electrons. They constitute the majority of the rays, that is, about 90%, but have a very slight penetrating power, not even passing through the tube wherein the radium is contained. The Beta rays, or second group of radiation, are negatively charged with electricity, are much smaller in number, but have a much greater penetrating power. They seem to be analogous to the rays given off from the cathodal end of a Crook's tube when acted upon by a proper electric current.

The Gamma, or third group of radiation, are present in a very small proportion compared to the other two, but have a high degree of penetration. They are also charged with negative electricity.

They are analogous to the X-Ray. The radio-activity of radium is due to the combined action of the three groups of radiation. The Alpha and Beta rays are material particles, while the Gamma rays are simply undulations. The *emanation* of radium as described by Rutherford is a luminous gas constantly given off and easily taken up by other substances which it comes in contact with, and become radio-active. However, this radio-activity is not permanent. These emanations are not given off through the glass, rubber, celluloid, etc., tube, only when the radium is not hermetically sealed. This fact disproves the claims made by some experimenters as being able to make radio-active fluid by simply immersing the sealed tube of radium into distilled water. Rutherford and Sudday have shown that thorium gave off emanations quite as active as those given off from radium, and certainly much easier obtained, because thorium is more plentiful and cheaper. Hugo Lieber has been successful in obtaining these thorium emanations in quantities and placed in proper apparatus to make them useful in practice of medicine, particularly in treatment of tuberculosis of the lung.

The luminescence can be demonstrated in pure radium very easily in the dark room. The salts of radium, however, have a very limited luminescence, and it is claimed that this luminescence is due to the action of the rays on some of the impurities, for instance, barium. The heat given off from radium is said by Curie to be equivalent to melt its own weight of ice in one hour.

THE PROOF OF RADIUM.

In order to prove that we have radium or its salts, and not other radio-active and inferior substances, we must resort to one or more tests. First, the electroscope, which will show in a few moments the activity of the substance as to its radiation in the manner it discharges the electroscope. Second, by the use of a photographic plate, exposing it to the rays of radium and using a flat key or any other small convenient substance to photograph, and in developing this plate will show the radio-activity of the radium. Third, the absolute proof of radium is by the use of an electrometer.

EXPERIMENTS.

A very interesting experiment was carried out by Prof. Danysz, of the Pasteur Institute, Paris. Twelve larvæ were exposed to the action of radium for one-half an hour; another twelve were kept as controllers and not exposed. After two weeks, mostly all of the twelve exposed were dead, and those remaining alive remained in the larval stage; while the unexposed twelve had already developed

into perfect butterflies. Six weeks later one larva of the exposed lot was still alive, while the lot not exposed had multiplied to the fifth generation. This experiment would indicate that exposure of embryonic bodies to the radium tends to retard their development, or can destroy their life.

Experiments as to the action of radium on bacteria have been carried on by Aschkinass and Caspari, Harry Crooks, Pfeiffer, and Frieberger, with almost universal positive results, such as retarding the growth or destroying such bacteria as the typhoid, cholera, and others.

Pusey gives a very clear résumé of the various experiments that were made as to the effect of radium on the living tissues, as, for instance, M. Bacquerel and M. Curie both developed burns on their bodies from carrying radium in their vest pocket without first protecting same by a lead body. These burns took two or three months to heal, and in the case of Hallopeau it took nearly six. According to Scholtz, it takes twenty-four to forty-eight hours for a radium burn to appear, but other observers, as Halkin, found it to be much later. When the radium is brought before the closed eye, it illuminates the same. Javal and London have experimented with the blind, and found no reaction as to perception of light wherever the eye was entirely blind, but in cases where the least perception was still present, the person would perceive a bright light.

Experiments on the nervous system with radium have proven that mice, particularly young mice, were either paralyzed or killed when exposed to radium for any length of time, and such symptoms as convulsions, coma, cachexia, have been quite common in these experiments.

Microscopical examination of tissue shows distinct changes. Guinea pigs and young pigs were used for these experiments, and the skin examined showed on the third day a change in the capillaries of the corium in that they were increased, and a few days later marked inflammatory changes could be easily demonstrated; later degenerative processes developed, which became absorbed. *Halkin* made the above experiments, and Scholtz made similar experiments with the X-Ray, and both authors agree that the microscopic changes in both cases are very similar. The radium rays will affect the normal tissue the same as they do pathological, only the resistance of the pathological tissues, as, for instance, the cancer cell, the cells of lupus or tuberculosis, the vegetable organism, is less than the cells of the normal structure, and they, that is, the pathological tissues, break down easier.

CLINICAL OBSERVATION.

When we consider the short time that radium has been added to our therapeutic armamentarium, and, on the other hand, look over the literature, foreign as well as American, we feel proud of the medical workers. Scarcely a number of any journal appears which does not contain an article or a report of cases of radium or wherein it has been employed, and most of them are extremely encouraging in their results. I would like to state that this fact has discouraged me somewhat, and if it was not for the fact that some other men have had similar results as I have had in not succeeding in every case, I should not perhaps be reading this paper today, and feel that there must be something radically wrong with either my diagnosis, my radium, or my technique.

The technique is so simple that I could not have made a mistake, since all it requires is to place the capsule or tube containing the radium on the part that we wish it to act upon, and allow it to remain from five minutes to half an hour, as one knows from reading or experience.

So far as the radium being of the proper kind is concerned, I had same tested by the electroscope as well as by the photographic plate, and it was found to be as represented, that it, fifty milligrams of radium of the 10,000 radio-activity, manufactured by Curies, of France.

As to the diagnosis, I will say that in most instances the cases were very clear, and in the majority of them microscopic examination was usually made before treatment was instituted.

The various conditions in which radium has been employed are principally skin lesions or pathological conditions on the surface of the body, since it is the better ray that is of greatest value in the radium, and that has only a penetrating power skin deep, as proven by the experiments of Halkin. The Gamma rays that have a much greater penetrating power are too few to be of any great value in the quantity of radium used.

In collecting the cases I have found the following conditions reported as treated with radium with more or less success: Acne, eczema, psoriasis, lupus, keloid, telangiectasis, epithelioma, carcinoma, sarcoma, rodent ulcer, chancroid, laryngeal tuberculosis, pulmonary tuberculosis, treated by inhalations of gases obtained from aqueous solutions of radium and thorium emanations, cyclitis and irido-cyclitis, convulsions, affection of the trigemina, and some other conditions not mentioned above which I treated and will report in detail.

I said most cases are reported with more or less success, and usually more than less. I can do no better than to repeat the remark made by Dr. Henry G. Piffard, of New York, who says in connection with these premature reports: "History has shown that wherever a new powerful therapeutic agent has been introduced, the earlier reports of its use are extremely favorable, especially from those who appear to be anxious to have their names connected with it, as being among the first to use it. More conservative observers reserve their opinions until they have accumulated a wider experience, and have learned not only the advantages but also the limitations of its therapeutic action."

While I feel somewhat guilty as to belonging to the category of Dr. Piffard's accused, in the reporting on the use of radium after only about six months' time, I want to acknowledge the fact that my reports are not very favorable, and should serve the purpose of stimulating others to work in this line, as I have promised to do myself, in order that we may come to the proper conclusions as to the therapeutic value of radium, particularly in the application in ear, nose and throat affections.

CORRESPONDENCE WITH PHYSICIANS.

I have attempted as much as possible to speak personally to physicians whom I knew had used radium in order to get their opinions, and where this was impossible, sent out the following five questions as to their experience with radium:

1. In how many cases have you used radium?
2. What were the pathological conditions?
3. What were the results?
4. Any complications, such as burns, etc.?
5. What strength of radium do you use, and have you had it proven?

I will not report in detail each answer, but generally. First, the number of cases treated were usually not stated definitely; usually less in number than what I had expected. Second, most cases that were treated were skin lesions or superficially located malignant disease. Third, the results promising and flattering. Fourth, no complications, as burns, etc. Fifth, most of them used a lower radioactive radium, and did not have it tested.

My experience with radium dates from Feb. 1, 1904, that is, just as soon as I was able to obtain it, and I have applied it very diligently and kept strict record of the cases up to date. I have found a great deal of difficulty in being able to keep the patients long enough under treatment to make proper observations. Clinical patients were

the most unsatisfactory, because they were usually in need of treatment, and the placing of a small capsule into the ear, nose or throat appeared to them not efficacious enough, although such a placebo as an innocent spray was often added to the treatment, in order to make them stick, consequently a large amount of my work came to naught, but I shall not report these cases. Most of the cases that I have been able to follow were private patients, although it became necessary in some of the cases to explain in detail that the treatment was somewhat of an experiment, and took longer to show results. This last remark shows you one of the greatest disadvantages that I have found in the use of radium in that it acted very slowly in some of the cases. Before I commenced to treat cases with radium, I proceeded to look up the literature as to the method of application of the radium, particularly in affections of the ear, nose and throat, but failed to find any, so had to work entirely independently and on my own judgment. I selected for my experiments such cases that I thought may be influenced by the action of the radium ray, and particularly the worst kind of cases, such that have been treated by other methods and failed, or conditions that I knew if other methods had been used, poor or no results would have followed.

REPORT OF CASES.

Case I. Mrs. M., aged 30, two children. Had always been fairly well. Family history shows sister died of tuberculosis. Venereal history negative. Two years ago noticed considerable trouble in breathing through her nose; complained of frontal headache and generally not feeling well.

Shortly after her left ear commenced to discharge, which continued to do so. I saw the patient about one and a half years ago, and diagnosed the condition as a chronic atrophic rhinitis, with a chronic suppurative otitis media. Treated the condition in the usual manner. The patient did not get better; in fact, the ear began to hurt her, and granulations were becoming more pronounced. I proposed a radical operation, for the cure of the suppuration of her left ear, to which she consented. The Stacke-Schwartz plastic operation was done; the result—the ear became dry, and remains so. About six months ago the patient returned to me with a great deal of difficulty in nasal breathing, particularly on the left side. Examination showed a soft granulating mass on the anterior portion of the septum, which bled very easily, on touch, about the size of a small hazelnut. Marked pain in the front part of the head. I removed a small piece of this mass for microscopic examination, and it was examined at the Columbus Medical Laboratories, by Prof. Evans, who reported to me

it to be tubercular. So far as the examination of her lungs or any other part of the body is concerned, it is negative, particularly as to tuberculosis, and consequently I made the diagnosis of a primary tuberculosis of the septum.

Treatment. Thirty-three applications of radium bromide from five minutes to a half an hour, at each side of the nose, as close to the pathological growth as possible, at intervals at first every day, and later three times a week, and finally once a week.

Observations. The headaches and pains disappeared almost after the second treatment. After about six treatments the mass looked better, and did not bleed as easily on touch. After twelve treatments the patient was able to breathe better, but far from free, and from this time on until three weeks ago, which terminated the thirty-third treatment, and the last, the improvement as to diminution in size of the growth has not been perceptible. The appearance of the mass was improved. It appeared harder, and looked as though the mucous membrane was going to cover it. In order to test the efficacy or superiority of the X-Rays to those of the radium, I treated the patient by means of a soft tube, four inches from the nose, for five minutes, using a current of 87 volts, and one and two-tenths amperes at the first sitting. Three days later no appreciable difference in the condition of the mass, and the second treatment, the same as the first, given. Three days later no appreciable difference, and the same treatment, with the exception of using a smaller voltage, say 70, and a greater amperage, say 2. Five more treatments have been given about the same strength, with absolutely no change in the condition of the mass.

Case II. Mrs. T., aged 39, contracted lues in 1901. Notwithstanding most thorough antispecific treatment, she developed tertiary symptoms of the worst kind, particularly in the nasal cavity. About three months ago she presented herself to me, and I found the entire septum, except a small portion of the anterior cartilaginous part, destroyed. All the turbinated bodies, as well as a portion of the right lateral wall of the nose, the lower wall of the sphenoidal sinus, was absent, and the whole surface in a marked ulcerated granulating wound with a very foul odor. The patient came for the relief of the pains she had within the nose and head, and for relief from the odor, which was so objectionable to the family and other people she came in contact with. The masses of crusts, perfect casts, would frequently drop into the post nasal space and be swallowed by the patient. The usual treatments for cleansing and healing, as well as deodorizing, were applied, such as menthoxol, followed by copious

douching with antiseptics; nitrate of silver, cauterizing the surfaces, etc., but with little relief. The usual anodynes were used in order to relieve the pain, which they did but partially.

Treatment. By means of radium applications intranasally, allowing the tube to remain on the various portions of the ulcerated nasal cavity for a period of twenty minutes every day. After three treatments the odor was markedly diminished, and the pain very much less in degree. I discontinued all the other methods of treatment except the mechanical removal by means of forceps of the crusts. There was no need of any internal treatment (anti-specific), because the urine examination showed free iodine. She had received large amounts of iodopin injections for a period of eleven weeks. These treatments by means of radium were carried out as said above for a period of two weeks, when the surfaces of the nasal cavity were in fairly good condition and healing, and the pain almost entirely disappeared. Lest I be misunderstood by the report of this case, I am not claiming an antisiphilitic remedy for the radium, but purely local. I have had several other such cases under treatment, but did not observe them long enough to make absolutely satisfactory reports; suffice it to say, however, that during the brief time I did treat them and observe them, the odor was markedly diminished, without the use of any other method of treatment.

Conclusions in this case would be the relief of pain and the destruction of the odor, by means of radium. The latter condition might be due to the bactericidal action of the radium, particularly on the saprophytic variety.

Case III. Miss R., aged 16, referred to me by Dr. Wm. Ballenger for radium treatment. There is a very extensive history of this case, which I will abbreviate as much as possible. The patient had been suffering from nasal occlusion for several months when Dr. B. first saw her, in 1903. She said that the obstruction was getting rapidly worse of late. Examination at that time showed all the turbinated bodies of both sides enlarged, and would not shrink by the use of cocaine, adrenalin, or cautery. Dr. Ballenger removed portions of the turbinated bodies, and the patient obtained some relief. Microscopic examination was made by the College Pathologist of P. and S., and found to be either tubercular or sarcomatous. The small amount of relief that followed the operation was of short duration, and after a few weeks a greater amount of obstruction was present, with the additional pain across the nose, and a perceptible swelling or broadening of the bridge of the nose. Dr. B. decided to do a second operation, and under general anæsthesia removed the turbinated structures as completely as possible. The relief from the sec-

ond operation was more marked, and lasted longer. Microscopic examinations of the tissue removed the second time were made by Prof. Evans, Columbus Laboratory, as well as by the College Pathologist, who found the tissues to be of sarcomatous nature. After about two months the patient returned with the same amount of nasal obstruction, considerable pain across the nose, with a perceptible widening of the same. In lieu of these facts, and the microscopical examination, Dr. B. decided to do a radical operation in the following manner:

Making an inverted U-shaped incision from one nasal process of the superior maxillary bone to the other, across the highest portion of the nose, then with a Gigli saw through the bony structures, and finally a third incision through the mucous membrane, turning the nose downward in that manner, exposing the whole nasal cavity. He removed all that he thought required removal or appeared to be sarcomatous. Although patient was very ill after the operation, for about a week or ten days, acting like a very septicemic individual, with the exception of a slight dacryocystitis, the wound healed by primary intention, and patient could and still can at this time breathe perfectly freely through her nostrils. The reason Dr. Ballenger referred the case to me was to prevent recurrence, if possible, and to relieve the patient of extreme pain in her nose and head, which would not respond to the ordinary anodynes. In consequence of these pains, patient was unable to sleep.

I applied the radium tube for ten minutes into the nasal cavities daily for four days, during which time the patient did not notice any improvement as to the relief of pain, but said that she commenced to sleep a little better, and that always right after treatment she felt very drowsy. After the fifth day of the treatment she reported some relief from pain. On the sixth day a positive relief from the same. From that day on for the next thirty days I kept strict record, and found that after the twelfth treatment she went a whole day without pain. I discontinued treatment for one day, when her pain was increased. I again reapplied the radium, and she was again relieved, this time for two days. Reapplied the radium for twenty minutes, and she was without pain for four days. When she returned at this time complaining of pain, I introduced a capsule that looked exactly like the one containing radium, only that its contents was made up of prepared chalk, and I introduced it into the nose for ten minutes. I instructed her to return the next day, and she voluntarily told me that she did not feel sleepy right after the treatment, as she always did after the other treatment, and was not relieved of her pain. I then introduced the radium again, and she was relieved for the next

three days. Ever since that time I have found the radium to act positively, as an analgesic in this case, and that it would act much quicker and for a longer time, the longer time we used it. She was absolutely free for three weeks of pain without any treatment, when she returned complaining of some slight pain, and the reapplication of radium for one treatment relieved her for a week.

At the last examination of her nose I found that the left side was getting somewhat occluded; perhaps with the malignant growth. However, the general condition of the patient is fairly good, and there were no evidences of secondary infection or metastasis.

Conclusions in this case are that the radium has acted as a positive remedy to relieve pain and to produce sleep, saying nothing of the possibility of the prevention of recurrence of the malignant growth.

Case IV. Mrs. W., aged 32, referred to me by Dr. Ballenger for the radium treatment, on account of pain in her nose. The history of the case is as follows: Dr. B. removed a ridge from the right side of the anterior portion of the septum for the relief of ear trouble. I presume O. M. C. Chr. Examination showed there was nothing unusual in the operation or healing of the wound. Patient complained constantly of having pain in the nose and ordinary methods that the doctor employed refused to relieve her. My diagnosis was either a neuralgia or hysteria, and Dr. B. concurred with me in my opinion. After the third application of radium for a period of five minutes to the seat of pain, the patient was relieved and after the fifth treatment she declared that she had no more pain. I discharged her, and asked her to return if she had pain again, but up to this day she has not returned.

I intended to test this case by putting in the tube containing prepared chalk, but had no opportunity, in order to prove the patient was only imagining the relief, or had really no pain.

Case V. Mr. B., aged 39, referred to me by Dr. Carl Beck for radium treatment, with the following history and findings. Patient complained of a sore nose and upper lip on his right side for the past four months. He had been under treatment by other physicians, who diagnosed the condition as syphilitic, and prescribed the usual anti-specific remedies, but the patient being of the more enlightened variety declared that he had never a primary sore, and no other symptoms, refused to use such remedial agents. When he presented himself to Dr. Beck the examination showed a small ulcerated area on the right ala of the nose, near the floor, and involving portions of the upper lip. In each hair follicle one could see a small amount of pus, and on epilating the same it showed disease. He made a diag-

nosis of sycosis, and treated him by the usual method, as epilation and salve treatment locally, and cauterizing the ala of the nose. The healing was very slow or not at all, and so when referred to me, I applied the radium directly in contact with the ulcerative surface for a period of ten minutes for five treatments, but because the condition was not markedly improved in that time, the patient asked the doctor to please do something else, for, as he expressed it, he could not see how a little bulb filled with a little powder, which he couldn't even feel, could do him any good. Dr. Beck therefore used the negative pole of a blunt end electrode needle, made a few applications into the diseased hair follicles, and the patient said he noticed condition was healing. After three such treatments the patient discontinued treatment, and declared he was well. About two months after this occurred I saw patient and found that the condition was entirely healed.

Conclusions. Conclusions in this case would be that the improvements following the use of radium are late, and I would appeal for the support that radium ray cured him, because we know the use of electrolysis or anything else in sycosis has always been very slow and unsatisfactory, and not permanent. However, another case will tell us in the future more about it, when we will be able to persuade the patient to have only radium applied, and no other treatment.

Case VI. Mr. T., aged 26. This man had for two years a dark brown mass on the top of his tongue, resembling long hairs, which caused him a great deal of annoyance in attempt to clear his mouth, and when taking on the recumbent position would cause him to constantly cough. He made several attempts himself to remove it by sharp spoon, and succeeded, but the condition would inevitably return, and like a strong beard, much stronger. I saw him about a year ago, and made a diagnosis of lingua negra, or a black tongue. I presented this case to the Chicago Laryngological Society, and published same in the Illinois Medical Journal, 1904. Dr. Lieberthal, who has seen several of these cases, commented on the difficulty in curing this condition, and advised the use of X-Rays, not knowing of or referring to the radium treatment at the time. Shortly after this I applied the radium on top of the tongue for several sittings, one week apart, lasting ten or twenty minutes. After several treatments we could remove these masses easily, and after the seventh treatment the tongue was clean and has remained so until the present day.

After the fourth treatment, patient came back the next day and complained of a soreness on the roof of his mouth. I found a large red surface over the anterior portion of the hard palate that I thought

might have been a burn, but since it appeared so soon after the application, and getting well inside of twenty-four hours by the simple use of a mouth wash, I believe that it was purely coincidental.

Case VII. Miss L., 21 years old, always been well. Mother died of some lung trouble. About five months ago she developed a sore throat, pain on swallowing, and her speech became muffled and hoarse. These pains soon increased, and radiated toward the right ear. There was a cough, and expectoration of muco-pus; amenorrhea for a year; poor appetite; had been losing flesh of late; gets hot flushes, particularly in the afternoon, and night sweats. Examination: Temperature, at 10 a. m., 99° ; in the evening, 100.6° . Pulse, 85 to 95. Pain on pressure over the thyroid cartilage, particularly on the right side. Some glands in the neck on the same side. Nose is free; also pharynx and ears. The larynx showed a swelling on the right vocal cord in the region of the right arytenoid. However, no ulceration. Microscopic examination of sputum shows tubercle bacilli in large amounts. Bright side of her lung, the apex is dull; some moist rales, and bronchial breathing. Diagnosis, tubercular laryngitis. Secondary.

The treatment consisted in the application of radium three times a week for half an hour each sitting. Some relief from pain. But the pain was so marked that I was tempted in justification of this fact to do something else. But even if censured, let me report the fact that I continued the application of radium for four more treatments, which was the limit of endurance of the patient, as well as myself, and I substituted the local application of lactic acid, which relieved the patient almost after the first treatment, so that I could use the radium in conjunction with other local treatment. The relief of pain was certainly more marked than when simple local treatment was used; at the same time, I wish to acknowledge the imperfect report of this case.

The last time I saw the patient, and obtained the expectoration, examined microscopically, and found it to contain just as many tubercle bacilli as before.

Case VIII. Mr. F., 57 years old. Referred to me by Dr. Hall. Diagnosis: Carcinoma of the larynx, with glandular involvement. Complains of terrific pains in swallowing as well as speaking. Cannot sleep. Usual method of treatment refused to relieve him, except high doses of opiates. Discontinuing these, and applying radium every day for half an hour, relieved the patient somewhat, and made him sleep. This one treatment encouraged me very much, and I volunteered to apply the treatment twice a day for the next three days, but it was necessary to give patient some opiates in order to

relieve him of pain. Notwithstanding this fact, I continued to apply the radium for a week each day for a period of half an hour, in conjunction with small doses of opiates, and I observed that the relief of pain was greater than when the opiates were used in large doses without the radium. After seven weeks of these maneuvers, I was notified that the patient had a violent hemorrhage, which exsanguinated him to such a degree as to prove fatal within two or three days.

Case IX. Mrs. L., aged 51 years. A markedly anemic woman; has had arthritis deformans for many years; came to me complaining of severe head noises and noises in her ears. Distinctly separated the two. The head noises were unbearable. Associated with this there was considerable amount of deafness. Diagnosis: Chronic catarrhal condition of the middle ear, of the dry sclerotic variety, with considerable involvement of the labyrinth. The hearing test by voice showed patient could only hear loud voice on contact. A C₂ 512 tuning fork is not heard by air conduction, and by bone only about ten seconds. The Gordon whistle, heard only close to the ear, and when blown very loud. The membranes are dull and markedly retracted. Usual naso-pharyngeal catarrhal conditions are present. This patient having been the rounds of a number of general physicians as well as specialists, office as well as clinic, did not improve; in fact, progressed for the worse. I treated her for four months by all the methods known to me or others, locally as well as generally. Finally, under general anæsthesia, I did the ossiculectomy, with only a partial effect of relieving the ear noises, and for a short time, but the head noises became worse. Consultation with a neurologist and a general practitioner before the operation, as well as after, did not clear up the condition for me, nor help me out in the least, and I did not know what next to do. One gentleman recommended the use of the X-Rays to the ears, which treatments she received for about three weeks, without the slightest relief. About that time I received my radium, and I applied it directly as far as I could to the tympanic cavity, every day for five minutes to one hour, for about six weeks, without the slightest improvement in hearing or the noises. There was absolutely no appreciable appearance on the drum membrane or canal of a burn or any action from the long exposure of the radium. I then discontinued the use of radium, and while studying the use of various rays, I decided to apply the high frequency current, which I suppose you are all familiar with. After eleven daily applications of the high frequency current directly to the ears, there is absolutely no improvement from this treatment. If the patient

will stick to me, I shall do the operation of section of the auditory nerve, as described best by ————— in the Journal of Laryngology, Aug. 1904.

Case X. Mr. C., aged 17. Complains of a foul smelling discharge, from his right ear, and severe pain occasionally in the right ear and right side of the head. Examination: A large mass of malodorous pus with white scales was removed, microscopically examined, and shows cholesteatomatous cells, staphylococci and a large number of saprophytic micro-organisms, and a considerable amount of pus corpuscles. Thorough cleaning out of the ear showed a granulating surface, particularly up and back. Hearing is markedly reduced; however, bone conduction prolonged. An artificial membrane, temporarily applied, improves hearing. Probing demonstrates dead bone in the attic. Washing out of the attic and sedimentation of the fluid shows microscopically bone particles. Diagnosis: Chronic suppuration of the middle ear with necrosis, either of the ossicles or a part of the temporal bone, most probably the latter, because hearing is so good when membrane is applied.

Treatment. Applied radium for ten treatments, three days apart, each fifteen minutes, in the external canal, as close to the middle ear as possible. Results: The odor was markedly modified, and the discharge lessened. The bone remained rough to the touch of the probe, and the cholesteatomatous masses and bone particles could be demonstrated at each microscopical examination of the sedimented washings from the attic. Pains in the ear were less marked. I came to the conclusion that very likely the necrotic bone could not be acted upon by the radium, and since the patient wanted to know if I could promise a sure cure by the radium treatment, which I could not, I decided therefore to operate, and did so by the radical method, after which the patient was well.

Conclusions in this case are that the radium as it did in the syphilitic ozena diminished the odor, and relieved the pain; also diminished the amount of discharge, which perhaps was due to the bactericidal action of the radium.

Case XI. Miss B. T., 24 years old; referred to me by Dr. Ballenger to relieve severe pains in her ears and head. History: Always in delicate health; had ulcer of the stomach about three years ago; then developed tuberculosis of the lung; has had a discharge from the left ear since childhood, when three years old, which followed scarlet fever. Dr. Ballenger operated for this condition radically in Oct., 1902; following this operation the patient has had constant ache in the ear and head, and periodical discharge from the ear for about a year, when a second operation was performed by Dr.

Ballenger. The last operation did not relieve the patient, so far as the pains are concerned, and in addition she complains of the right ear, or, rather the right mastoid, being very painful; besides, most intense pains in the head, all the time. Prevents her from sleeping. Medicinal treatment, as far as the relief of the pain is concerned, has been very unsatisfactory. When I first saw the patient, six weeks ago, I found the following condition: An ill-nourished young woman, somewhat anemic; left ear discharging yellow pus; along the retroauricular incision, a small fistula leading towards the attic of the ear; surface of the tympanic cavity, or, rather, the cavity as the result of the two operations covered with granulations, but no rough bone or dead bone is discernible by means of a probe.

The hearing is markedly diminished in the left ear. The right ear shows no changes nor evidences of having had any suppuration. The mastoid is painful on deep pressure. The head all over seems to be tender on percussion. Drs. Williamson, Ballenger and myself think the condition is a tubercular process, and very likely the meninges are involved. I started the treatment with radium on July 11th, and have treated her daily up to the time this report is made. For two weeks patient showed not the slightest improvement, so far as the relief of her pain as well as being able to sleep were concerned. After that she said she could sleep better, and now for the past ten days she sleeps very well every night. The pains have not been affected in the least, although the patient is able to stand them better, because she rests well at night. The radium tube is placed in both external auditory meati, and into the nose for a period of ten, or fifteen minutes. The reason it was placed into the nose was because the action of the radium as a sleep-producing remedy is better obtained when placed in this cavity high up in the olfactory region, as near to the brain as possible.

There were two peculiar conditions developed in this patient, which may, however, be purely coincident. First, after the radium was in the nose or ear for a few minutes she developed a distinct flush of her face, very much like erysipelas, with a distinct line of demarkation, and with a rise of temperature to $100\frac{1}{2}^{\circ}$. M. Davidson reports two cases that he treated for carcinoma of the face wherein similar conditions developed as in my case, but the temperature was much higher in his case than mine. Temperature in my case might have been due to her supposedly tubercular disease.

There were several cases treated in my office not in the line of ear, nose or throat, by myself and other physicians, in order to prove or compare the results, and I wish just to refer to them very briefly. One case of rodent ulcer of an amputated stump in a man who has

arterio-sclerosis generally. The ulcer would not heal for eleven years, and after application of radium for ten treatments, ten minutes each, it healed perfectly.

One case of carcinoma of the uterus, removed by radical operation, after which she had severe pain; the radium was applied twice a week, and relieved the patient completely of the pain.

And several other cases, which, suffice to say, were all very satisfactorily treated.

Again, I have treated several eye affections with radium, but since this is not within the scope of my paper, and besides I wish to make this a special report at some future date, I will not say anything more about them than that the results are about the same as in the ear, nose and throat, and that is nothing very startling. I wish to conclude with an appeal: Let us learn more about this radium; let us not report prematurely on the results obtained, and do exaggerate just a little in order to stimulate others, because the stuff has certainly great virtues, and I am sure by the many men using and experimenting with it we will be able to place it just where it belongs in our therapeutic measures. I certainly promise to work at least one more year experimenting with the radium; as I already said, it is so difficult to get material, because it does not appeal to the patient that anything is being done for him, on account of the length of time that any result is seen.

Herewith follows a complete report on all the cases that I have been able to collect in English, German, French, Russian and Swedish, with a complete index of the literature:

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Primary Tuberculosis of the Intestines and Adenoids—SUKEHIKO ITO—*Berliner Klinische Wochenschrift*—Jan. 11, 1904.

Ito has frequently noticed food particles in the lacunæ of the tonsils, and believes that tubercle bacilli can enter the tonsils from infected food. He reports two cases; one, a case of chronic purulent bronchitis, the other a case of heart disease, in which the macroscopically normal tonsils showed tubercular deposits on microscopical examination.

YANKAUER.

DISEASES OF THE SALIVARY DUCTS AND GLANDS AND THEIR TREATMENT. REPORT OF CASES.

BY ROBERT C. MYLES, M.D., NEW YORK.

The diseases commonly associated with these organs are fistulae, inflammations, both specific and non-specific, cysts and other tumors, and sialolithiasis.

The affection to which the term sialolithiasis is applied is often considered as a comparatively rare disease. Salivary calculi are more often found in the ducts than in the glands themselves. The most common site is the submaxillary duct and gland, next the parotid, with Steno's duct, and lastly the sublingual glands with their excretory ducts. Statistics show that the duct of Wharton and the submaxillary gland contain over 60% of all salivary stones, the parotid about 20% and the sublingual about 18%. Men seem to be more often affected than women, and especially during the middle years of life. Children are rarely affected, but one instance where a congenital salivary calculus was present, has been reported. The larger stones are usually found in the glands. The size and number vary within considerable limits and bear a certain relation to each other—the more numerous the stones, the smaller they are apt to be. The form and shape of these calculi are determined to a certain extent by their situation—those occurring in the excretory ducts being elongated and cylindrical, while those in the gland are round and irregular. Salivary stones are composed of both organic and inorganic materials, the latter usually phosphate of lime, less often the carbonate, or sometimes both together. The organic constituents are bacteria and salivary corpuscles.

A number of theories have been advanced to account for the origin of these calculi. In some cases foreign bodies which have found their way into the ducts or glands, form a nucleus for the deposit of the mineral salts. During recent years, however, it has come to be believed that an infectious process underlies their formation, as for the production of concretions elsewhere. Klebs and Galippe have shown that the bacteria found in the interior of the calculi are derived from the mouth. Some of them may have settled on some rough spot in the mucus membrane of the ducts brought about by an inflammatory disturbance. Around this clump of bacteria, the con-

* Read at the Tenth Annual Meeting of the American Laryngological, Rhinological and Otolological Society held at Chicago, May 30, 31 and June 1, 1904.

cretion forms. In addition to bacteria, Hanszel alludes to two other etiological factors—a chronic inflammation of the gland substance with retention and thickening of the secretions, and long continued irritation, such as may be produced in the sublingual region by the mouth piece of a tobacco pipe. Klebs considers that the *leptothrix bacillus* is also one of the frequent exciting causes.

As long as it does not cause complete obstruction, a stone or other foreign body may remain in situ in the duct or the gland for many years without producing any symptoms. Very often a stone suddenly makes its appearance in the mouth during a meal. In general it may be said that the disturbances are more serious when the stone is situated in the duct than when it is located in the gland. The most characteristic symptom is the intermittent appearance of a salivary tumor produced by the salivary stasis. Such attacks are accompanied by severe pain and are aptly termed by the French, "*coliques salivaires*." The pain may come on suddenly during a meal, or in some instances even at the mere sight of food. The duct often becomes inflamed and a *pyorrhœa* follows. *Ranulæ stomatitis* and salivation are also ordinary accompaniments of the condition.

The affection is not so uncommon as is ordinarily supposed. As the means for recognizing the disease are becoming better known, an increasing number of cases are being reported. In the last available issue of the Surgeon General's Catalogue, over 100 papers on the subject in question are recorded. The diagnosis depends on the recognition of the stone with the finger or the sound. If the physical signs are less prominent, but the characteristic attacks are present, the possibility of a stone should always suggest itself, although a similar train of symptoms may be brought about by inflammatory disturbances in the excretory ducts. Lately the employment of the X-Rays has afforded an important aid to diagnosis, as illustrated in the reports of Alsberg and Gerota, who employed them for this purpose. Many cases are undoubtedly mistaken for an alveolar periostitis, when the inflammatory symptoms occupy the foreground of the picture and render local examination a difficult matter. Where the gland itself is the site of an inflammation due to the presence of a stone, it may be difficult to exclude a simple inflammation of the gland or even of a lymph node. Where the development proceeds very slowly and without marked inflammatory symptoms, malignant tumors, tuberculous lymphomata, gummata or osteomata may be diagnosed by mistake.

Treatment should be directed to removal of the stones through the mouth whenever possible. Kuttner states that the only exceptions to this rule are the presence of an external fistula leading to

the concretion, or when the latter lies in an external abscess, or when the parotid or maxillary gland itself is the seat of the stone. Where the calculus is near the orifice of the duct, it may in many cases be readily squeezed out, but where it lies deeper it is necessary to slit open the duct. These operations may be done under local anæsthesia. Where the stone is in the submaxillary or parotid gland, an external exposure is often necessary, supplemented by the entire or partial resection of the gland. When operating on the parotid the facial nerve must be carefully protected. Hanszel reports a case where the operation was followed by a slight facial paralysis.

The writer has had under observation a series of very interesting cases which he is desirous of placing on record.

Case I. Mrs. M., consulted me for a large tumor under the left side of the tongue, which interfered with speech and also with the complete closure of the mouth. She presented the peculiar characteristic appearance of the mouth and face which is associated with this class of cases. Examination disclosed a cystic tumor about the size of a hen's egg, situated between the tongue and the lower jaw, and extending from the incisor back to the last molar tooth. The tongue was displaced to the right and upper part of the mouth. The diagnosis was self-evident. The contents of the cyst were evacuated by incision, and after a few days when the swelling had subsided, a small probe similar to the one shown, was passed into Wharton's duct. A collection of small calculi was detected about $1\frac{1}{4}$ inches from the ostium. By the aid of cocaine anæsthesia, the calculi were removed with a curette, the extraction being accomplished with considerable difficulty. The duct was gradually dilated with silver bougies. The cyst wound healed slowly and the cavity contracted. The duct was kept open by silver sounds passed every two or three days for a few months, and the patient made a satisfactory and complete recovery.

Case II. I was called in consultation by a general practitioner to see Mr. H. He gave a history of having suffered with soreness and fullness of the right side of the base of the tongue, the floor of the mouth and the larynx. He was very stout and had a short, thick neck. There was serious interference with respiration. The epiglottis was intensely swollen and was pressed upon by a large teat-like swelling on the lowermost part of the base of the tongue. A small fistula was to be seen in the floor of the mouth near the last molar tooth. The cedematous epiglottis was incised in several places with a protected laryngeal bistury and the swelling rapidly subsided to about half its former size. The projection at the base of the tongue was seized with a lingual tonsillotome and its apex cut away.

It contained a burrowing cystic abscess, filled with salivary and muco-purulent secretion. All the alarming symptoms rapidly subsided. Careful bimanual palpation then revealed a rounded mass in the location occupied by the submaxillary gland. The lumen of the canal was then enlarged by the introduction of a rectangular knife. With a probe it was possible to feel a foreign body about $\frac{3}{4}$ of an inch from the surface. A pair of dilators of the same pattern as those used for the cervix uteri were then inserted and the tract dilated to about 15 millimetres. By means of curved forceps and the curette, several small pieces of calcareous matter were removed. A curved silver probe which was introduced, could be passed by the submaxillary gland, under the base of the tongue and into the cystic cavity which had previously pressed upon the epiglottis. The wound was packed for several months and gradually healed by granulation. Several attempts were made to introduce a sound into Wharton's duct, but it was impossible to penetrate the normal opening. The patient was dismissed some months ago and has had no further trouble.

Case III. This case I have previously referred to at a medical meeting. The patient was an officer in the regular army and while on post duty had suffered so much from the pain and distress caused by his condition, that he was compelled to neglect his official duties and was wrongfully censured. There were few objective symptoms. A small lump could be felt in the submaxillary region. I succeeded in passing a probe through Wharton's duct and when it reached the maxillary gland, it came in contact with what was apparently a stone. An incision was made through the floor of the mouth near the last molar tooth and close to the gustatory nerve. The incision was then forcibly dilated with a uterine dilator. The stone was found to be imbedded in a net-work of fibrous tissue bands, which occupied the crevices in the roughened calculus. The latter was pulled up into the floor of the mouth with tenaculæ and the tooth forceps and the adherent bands severed by a curved knife with a very sharp point. The stone was then extracted, the duct dilated, and the patient made a complete and uninterrupted recovery and has continued well for several years.

Case IV. Mr. N., a business man about 40 years old, applied to me for relief for a swelling beneath the anterior part of the tongue, which extended down behind the chin to the hyoid bone. An incision was made into the tumor and the characteristic salivary secretion evacuated. This patient was one of my first cases and I had not thought at that time of forcible dilation of the duct. I tried for several months every method that I had ever heard of for curing

the condition. I made openings into the cavity, and kept them open for weeks with tubes. Then I curretted, applied carbolic acid, and still the thing recurred. I requested a general surgeon to try and relieve him. He made an incision from the chin down to the thyroid cartilage, exposed the entire extensive cavity, dissected away all the membrane he could find, and thoroughly cauterized the surface with Pacquelin cautery. The condition again recurred, however, and another surgeon removed the sublingual and submaxillary glands. This cured the cystic condition, but the distress caused by the constant lack of saliva, gradually made the man morose, melancholy and apathetic, and caused him to spend most of his time endeavoring to moisten the dry area on the operated side of his mouth by placing his tongue over it. This was accompanied by a gradual decline and the patient finally died from what was apparently a form of dementia and malnutrition.

Case V. This is a young woman about 25 years old, an actress in one of the leading New York theatres. She consulted me about three months ago. Examination showed a stone lodged midway in Wharton's duct as large as a pea. From time to time it obstructs the flow of saliva, but otherwise does not cause any serious inconvenience. As she is playing an important engagement, I have advised her to wait until the end of the season and then to have the offending calculus removed.

The points of interest taught by the histories of these cases are, first, that it is necessary to make a thorough test of every known method in order to obtain a correct diagnosis in suspicious cases; second, that the removal of these calculi can best be accomplished by surgical procedures, preferably through the floor of the mouth, and third, that it is always well, where possible, to probe and dilate the duct, and thus to establish and maintain the normal flow of salivary secretion.

GRAVE HEMORRHAGE FOLLOWING TONSILLOTOMY.*

BY L. C. OLIVE, M.D., INDIANAPOLIS, IND.

On Sept. 24, 1903, Mr. K. called at my office with his son, aged five years. The father stated that the son had been afflicted repeatedly with sore throat or tonsilitis for three years, and that he was very anxious to have him relieved if possible. Examination revealed hypertrophy of the tonsils, the left being larger than the right and presenting a nodular and ragged appearance. The right tonsil was well defined but small. The boy was robust and healthy in appearance.

Following my usual custom of investigating every operative case as to a hemorrhage diathesis and explaining to the father that about the only thing we feared was bleeding after the operation, but this danger as a rule was very slight in children where there was no bleeding history. I told the father the tonsils should be destroyed or removed, and inquired if he knew anything in the family history or have any cause to fear hemorrhage after clipping out the tonsils? He answered that he did not know of anything to contra-indicate such a procedure.

I at once proceeded to remove both tonsils with a McKinzie tonsillotome which was quickly and easily accomplished. There was about the usual amount of hemorrhage that occurs in such cases, which entirely ceased in a few minutes. After one-half hour wait, and again looking at the throat and finding it free from oozing, they returned home. The hour was 10:30 a. m.

Nothing more was thought or heard of the case until 5 p. m., when I received a telephone message to come to the house at once, the boy was vomiting blood. On arriving I found the left tonsil slightly oozing. An ordinary sized chamber was sitting beside the couch which looked to be about one-third filled with dark clotted blood.

A solution of supraenal capsule was immediately applied to and around the bleeding surface; this seemed to stop the bleeding. Before leaving, I prepared a gargle of gallic and tannic acid to be used frequently. At 10 o'clock I was called and found he had again vomited quite freely of blood, the cut surface was oozing. I then applied the adrenalin 1 to 1000 and gave him 5 drops internally, which to all appearance controlled the hemorrhage. Before leaving,

* Read at the Ninth Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology held at Denver, Colo., August 24, 25 and 26, 1904.

I carefully applied a 40-grain solution of silver nitrate for its astringent effect. Ice bag was applied to the neck and cracked ice given by the mouth. Adrenalin was ordered in three to five drop doses every four hours.

On calling in the morning I found that he had again thrown up quite a quantity of blood. The child was growing very weak and faint. Finding the surface oozing again, I applied a solution of chromic acid and ordered fluid extract of ergot internally. Quiet and the ice were continued with an occasional enema of normal salt solution. Vomiting occurred at 10 a. m. and at 5 p. m., when I again applied suprarenal capsule with pressure which was followed with Monsel's solution. The patient had now grown very weak and irritable from the loss of blood. I ordered 3 or 4 drops of laudanum followed by 5 grains of chloride of calcium in four ounces of warm water to be injected high up in the colon every four hours. This was alternated with a pint of normal salt solution. A small amount of blood was thrown up again at 11 p. m.

There was no further bleeding for 24 hours. The boy although very weak had taken some nourishment and had begun to improve. On the morning of the fourth day after a fit of coughing the bleeding was started again. Examination now revealed both tonsils bleeding, pulse was very weak, beads of perspiration was observed over the face and neck. The cadaveric appearance of my patient was not very encouraging. I at once gave an injection of normal salt solution to be alternated with 5-grain doses of chloride of calcium by injection. Local applications were made as before. Vomiting occurred twice during the day and once during the following night when the boy had a prolonged sinking spell from which he revived after a dose of strychnine and the salt injection.

For the succeeding 24 hours life seemed to hang in a balance responding only to strychnia and the normal salt solution injections. After about all the remedies that I could command had been tried and all the red blood had oozed away and had been replaced with the salt and calcium solutions, my patient was with careful feeding and the use of tonics gradually restored to health.

On my first visit to the house I learned from the mother of the boy that his grandfather was a bleeder all his life and that his life was spared on various occasions. She stated that had she known the boy was to be treated she would have told me about the grandfather and also that when the boy received a scratch, cut or bruise, there was a great tendency to bleed and effusion, and would get well very slowly. All this the father frankly admitted he did not know. The father thought he would do his wife a kindness to have the tonsils removed without her knowledge as she was far advanced in pregnancy.

The only pleasant remembrance I have of this case is the very cordial treatment with never a word of criticism during the entire treatment and a prompt and full settlement of the account.

I hope you will pardon the details of this case but it shows how we may be misled after all the ordinary precautions.

Willoughby Building, 224 North Meridian St.

A NOTE ON THE USES OF RUBBER IN THE TREATMENT OF NASAL AND ANTRAL DISEASE,*

BY J. PRICE-BROWN, M.D., TORONTO.

So little has been said or written by rhinologists upon the use of rubber in the treatment of the different forms of nasal disease, that I fear it has not yet been appreciated at anything like its true value. In many cases where distinctly applicable, it has not been used at all; and while men are willing to acknowledge its possible utility, they are doubtful about making a trial—perhaps unwilling to tread on new ground.

Five years ago I read a paper before this society upon "The Use of Rubber Splints in the Treatment Following Intra-nasal Operations." And two years ago another before the American Laryngological Association upon "The Use of Rubber Splints in the Treatment of Septal Curvature."

During all this period up to the present time I have made constant use of these splints in suitable cases; and instead of my faith in their efficacy being weakened by oft repeated use, it has steadily grown stronger.

These splints are particularly applicable in the treatment of chronic nasal synechia. The synechia is removed and a suitable rubber splint placed between the raw surfaces upon the septum and the corresponding turbinated—and it is allowed to remain in situ until new mucous membrane has formed over the abraded tissues; and the danger of reunion is over.

But these splints are still more applicable in the treatment of those severe cases of deformity of the triangular cartilage which so frequently occur. My method of operating has already been published and need not be referred to here. This much I may say, however, that after the cuts have been made, and the septum has been pressed into its normal position, the splint is inserted and not removed again until the healing process has been completed and the septum permanently fixed.

Of course the patient is treated aseptically at the time of operation, the parts are regularly cleansed during the process of healing,

* Read at the Tenth Annual Meeting of the American Laryngological, Rhinological and Otorological Society, held at Chicago, May 30, 31 and June 1, 1904.

and the operator retains the care and control of his case to the end. These are essentials no matter how we treat our cases.

In my own experience, after using nasal tubes designed by different distinguished rhinologists, and silver tubes made by my own order to suit each individual case, I feel compelled to discard them largely in favor of the nasal splint. There are individual cases where the tube must be used; but in the large majority of cases, the simple rubber splint does better work.

Its advantages are simplicity of design, ease of insertion, certainty of retention. With the exception of a slight irritative fever which sometimes occurs during the first day or two, there is no increase in temperature during the whole course of treatment. The patient is comfortable. There is no irritation or disturbance of the parts by removal or reinsertion of the splint—something which cannot help but occur when you remove and replace a tube at regular intervals. What is best of all—a fact which cannot be over-estimated—the replaced cartilage remains immovably fixed in its new position until perfect union and consolidation has taken place. Then the splint for the first and last time is removed.

I now come to the main point of my paper—The use of rubber tubing in the treatment of antral empyema.

There are certain cases of chronic antral disease which come under our observation that are exceedingly difficult to cure, and it is about a case of this class that I desire to say a few words.

A year ago in the discussion of Holbrook Curtis' exhaustive paper upon "The Technique of Maxillary Sinus Operations," I asked him if there was an age limit to his third or radical operation. His reply was that it was "particularly appropriate for aged people."

I had at that time a male patient, aged 65. He was thin and neurotic, and suffered from rapid heart action. Right antral disease of a severe character had existed for years. The discharge was abundant and fetid and was accompanied by right frontal headache of a throbbing character. I suspected the complication of frontal sinus disease. The sequel proved this to be an error.

A year previously I had opened into the antrum through the alveolus. This was followed by regular washings, which he was usually able to do for himself; but there was no amelioration in symptoms.

While impressed with the wisdom of the radical operation, I did not think it would be advisable in my case, owing to the conditions already referred to. It seemed to me that the case was hopeless—but if I could secure a permanent fistula in the canine fossa, the antrum could be readily washed out as long as he lived.

Hence I did Curtis' first operation, making a large opening with hammer and chisel, curetting the antrum, washing with boracic solution, and packing with iodoform gauze. The question then was how to make the opening permanent? Unless the perforation into the canine fossa is exceedingly large, there is a constant tendency of the redundant tissue above to cicatrize downwards and close up the opening. In this position something more than a peg is required. Nothing short of an obturator—something that will hold back the tissues—will fill the bill.

Dental gutta percha is recommended for this purpose. You can soften it and mould it into the shape you want; but once hardened, it is inflexible and brittle. Not only so, but at its temperature at the time of insertion it is too hard to mould the inner end, so as to retain its position accurately. Silver tubes, I have often used, each made for its own special case, but the hard metal is apt to cause discomfort and to favor the development of granulations.

While casting about for some suitable device, the idea occurred, that pure rubber tubing might do, cut short, and each end curled upon itself in dumb-bell shape. I decided to try it, and found that by combining compression and pressure, the one end could be readily passed through the opening in the canine fossa into the antrum, the other end remaining outside in the incised tissues, and the neck occupying the osseous perforation. The position was fixed and firm, and the compressible appliance produced no abrasions.

For several days there was edema of the cheek, but this soon passed off. The tube was never plugged, but the antrum was regularly washed out twice a day through the tube and out through the ostium maxillare. This was continued for months, during which time the discharge gradually lessened and the head symptoms gradually passed away.

I must say, however, this being my first experience in the use of rubber tubing in the treatment of antral disease, that I was in dread of the rubber rotting and the inner end dropping into the antrum.

Still as the main object in view was to produce a permanent sinus, through which lavage could always be accomplished, the obturating tube was retained in position for six months. By this time the discharge had almost ceased. On removal by forceps the inner end of the tube unrolled and it slipped out without difficulty. It was, however, perfectly strong and free from abrasion, but of a firmer texture than when inserted; showing that the tube could have been retained in position for an indefinite length of time without interfering with its usefulness.

After its removal the antrum was washed out, but there was no discharge, for the disease was cured.

One thing further, a perfect sinus had formed coated with ordinary mucous membrane, and for amusement more than anything else, the old gentleman occasionally fills his mouth with warm water and forces the clear fluid out through his nose.

One word more about another use to which rubber may be applied.

There are many cases of nasal disease in which although the passages may be sufficiently open to permit of normal respiration, yet owing to accumulation of secretion while sleeping, the mouth drops open and oral respiration is the result. In consequence of this, the dry air entering the pharynx absorbs the moisture exuded by the superficial glands for the lubrication of the mucous membrane, and chronic pharyngitis and laryngitis is the result.

For the last twelve years I have endeavored to remove this cause of oral respiration by the use of rubber mouth-pieces made of pure sheet rubber about one-eighth or one-twelfth of an inch thick. The piece is cut to fit the cavity of the mouth between the teeth and the lips. The latter are closed over it, hiding it from view, and when worn oral respiration becomes impossible—the patient being forced to breathe through the nostrils.

The patient on retiring clears the nostrils, and after dipping the mouth-piece in cold water inserts it. In many instances breathing will go on all night without removing the appliance. If coughing occurs forcing the piece out, the patient usually awakens and readjusts it. Likewise, if nasal obstruction becomes so severe as to force its removal, the parts are cleansed and the rubber replaced.

Formerly I ordered a tape to be stitched to the center of the outer side of the mouth-piece, the two ends to be tied behind the neck to keep the appliance in place—but experience has proved this to be unnecessary.

One other point, as a somewhat elaborate and ornate rubber mouth-piece has recently been placed in the market. I ordered one for a patient of mine to compare with that made from the ordinary rubber. He has tried both faithfully, and reports that the patent one, although cumbersome, retains its position better, while the one cut out from the simple rubber sheeting is much the more comfortable. One advantage of all these rubber appliances, is that they can be easily made by the surgeon.

WHAT CONSTITUTES PROPER NASAL TREATMENT IN CHRONIC EAR DISEASES? *

BY JOHN A. DONOVAN, BUTTE, MONT.

Oculist and Aurist Murray & Freund Hospital, Butte, Anaconda and Pacific R. R.

A patient, who recently had adhesions loosened in both ears under general anaesthesia, consulted me presenting letter from a prominent aurist, stating that with appropriate nasal treatment favorable results might be expected. This patient had also been treated some weeks in Vienna. Inspection revealed a septal spur too large to allow a catheter to pass. This case following several similar experiences suggested the title of this paper.

Universal as our literature is on the necessity of correcting nasal deformities, in practice the world over, today with the exception of comparatively few men, only the grossest deformities seem to receive attention no matter how severe the symptoms. Dr. E. Pyncheon's paper before this society last year (*LARYNGOSCOPE*, July, '03) probably describes an ideal nose as nearly accurate as our knowledge will permit. Such discussions must ultimately lead rhinologists to accept a somewhat uniform standard of practice, which will redound much to the credit of this branch of surgery, much more to our patients.

From observation, I believe when there is a catarrhal inflammation in the middle ear resulting from, or associated with a similar condition of naso-pharynx, nothing short of an anatomically and physiologically perfect nose will suffice to permanently check the condition, providing the patient continues to reside under the same environments, which most people will do. There is no deformity, however small, but to some extent influences respiration. This, while the patient is under observation in the office, may be unimportant, yet under less favorable conditions as sudden change of temperature, moisture, altitude, recumbent position, indigestion, etc., this trifling obstruction, for the time being becomes a decided one. Though the effect of such irritation be but temporary in the nose, its frequent occurrence sooner or later sets up changes in the ears which do not subside so readily, till one following another becomes a chronic, continuous irritation in itself.

A prominent factor but little dwelt upon in the etiology of otitis is:—if any nasal obstruction exists, during inspiration there is in

* Read at the Ninth Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology, held at Denver, Colorado, August 24, 25 and 26, 1904.

direct proportion to the obstruction a negative pressure produced in the naso-pharynx. This produces rarefaction in the middle ear and collapsed ear drums. This same vacuum must produce a turgescence condition of the tubes, thus maintaining a pathological condition in the middle ear. That a lessened air pressure will produce this condition while there is no direct evidence of it in the respiration, may be demonstrated by the dullness of hearing produced in many while ascending considerable heights; many people especially after having their attention drawn to it will experience this condition in crossing the mountains on a train. Accustomed as I am to high altitudes, I always experience it when traveling. That this cannot be due to the change of pressure directly on the ear drums is shown by the fact, that if no other factor existed the pressure must be equal on both sides. The frequent cases of epistaxis and menorrhagia in those first moving to high altitudes prove the engorged condition of all mucous membranes. The changes in circulation alone are not sufficient to explain all the phenomena.

There remain few aurists who doubt or dispute the nose as an etiological factor in this condition; as practically all admit it, then how should it be treated. The excuse given for non-surgical interference is that many deformities produce no symptoms, which is true, but these people do not consult us for treatment. It is, therefore, of patients who have some symptoms, however mild, already existing of whom I speak; and I may add the milder the symptoms in the ear the more urgent and the better the results of immediate, thorough, radical treatment of the nasal condition. To quote from paper previously referred to, "As structural deformity of some kind will be found present in the noses of all, or nearly all who apply for relief from the nasal trouble, the rhinologist will do his patients the greatest amount of good by taking such steps as will cause the nasal passages to resume the conformation and patency of the ideal standard.

Probably the most frequent obstructions are septal spurs, usually small and opposite the anterior end of lower turbinate or may be situated any place. Small hypertrophies in this locality are so frequent they might almost be considered normal if it were not for the decided improvement often following their removal. Before adapting the method of retaining the mucous membrane, it was a question often whether to risk the removal of what on examination appears to be an inoffensive enlargement, but with this method though longer time is taken in operating, the reaction is so slight, pain so little, recovery so rapid and complete that there remains no reason for taking any chances of their producing further trouble.

One suggestion in regard to technic. After cleansing and cocainizing, the mucous membrane is elevated; a small spur may be quickly removed with Freer's sharp cutting spud or dissecting knife or a burr, the larger ones with saw, trephine or chisel; in any event the subsequent use of the burr will remove any ragged edge and make a smooth surface to which the mucous membrane adheres and heals more readily. In deflected septum, possibly the submucous dissection is the ideal method, and especially so if complicated by much hypertrophy. A modification of Gleason's operation in most of cases has given me such good results, I feel loath to abandon it. I continue both upper ends of the incision, cutting entirely through the cartilage if possible, protecting the skin by raising it with thumb and finger of other hand. This makes a longer flap and completely destroys its resiliency. I use no plugs for after treatment at all, finding them not only unnecessary as a rule but objectionable. For enlargement of middle turbinate, the scissor and snare, and for lower turbinate the saw and scissor, removing only sufficient of the edge as described by C. R. Holmes (*N. Y. Med. Journ.*, Sept., '00) will complete either operation from a fraction of to a few minutes' time, especially if a mechanical saw be used. The De Vilbiss saw is small enough to engage, and will easily remove any portion of the lower turbinate in a few seconds. With motor and mechanical saw, the time and consequent pain, hemorrhage and fatigue experienced in cutting thick or hard bone anywhere is eliminated, thus simplifying the operation.

With skill and practice any of these deformities can be corrected in a strictly surgical manner in but a few minutes' time longer and with as little pain and discomfort as would require for a single application of any of the less radical remedies. The risk and disagreeable results immediately following is of course greater, but the use of an adrenalin and resorcin spray to control hemorrhage, immediate application of orthoform powder to relieve pain and some form of menthol spray is less objectionable than the necessity for frequent irritating applications that at best have but a temporary effect.

The time to operate in most of these cases is at once. Except where there is positive danger of infection, the patient who is operated on before leaving the chair fares infinitely better than the one who takes days, weeks and more likely years to consider some dreadful operation to be performed. Assuming the patient has come for treatment and circumstances will permit of avoiding heavy manual labor a day or two should it be necessary, a few words of assurance, careful application of the anæsthetic, a skilled manipulation of the instruments completes the worst feature of the case. The patient

gains confidence instead of fear and the after treatment or other operations are done without trouble or anxiety. Of course, in case of immediate operation there must be no possibility of a doubt as to the procedure. Where doubt exists, then the case must be first studied. I doubt the utility of prolonged preparatory treatment to render a surface aseptic that of necessity must constantly be exposed to new sources of infection every moment. Also, any after treatment which prohibits the free escape of secretions is to be avoided when possible. In cases where systemic reaction has followed in my practice it has much more frequently been when I have used packing.

When it is necessary to attack soft tissue only, punctures with cauter point are preferable to the use of acids as a rule, being more easily handled and less painful. In every case it is individuals with whom we have to deal, not isolated portions of anatomy, so there can be no positive rule to which there are not many exceptions.

In conclusion, would suggest that when nasal treatment is indicated as a remedy to lessen or check middle ear inflammations nothing short of anatomically and physiologically perfect nasal chambers be aimed at. That those methods of procedure be recommended that will accomplish the most thorough and permanent results in the least possible time with proportionally the least danger. That unless there are positive indications to the contrary immediate surgical treatment should be advised and operations be repeated as often as considered safe till no obstruction remains, irrespective of size or number of obstructions present.

The Treatment of Granular Pharyngitis and of Pharyngitis

Latialis—J. HERZFELD—*Monatsschrift f. Ohrenheilkunde*—May, 1904.

The author has devised a forceps having an oval, fenestrated cutting extremity, for removing small masses of adenoid tissue, (granulations) from the walls of the pharynx.

YANKAUER.

ORDINARY TONSILLOTOMY,*

BY EDWIN PYNCHON, M.D., CHICAGO.

Professor of Rhino-Laryngology and Otology Chicago Eye, Ear, Nose and Throat College.

(With presentation of New Instruments.)

Protruding tonsils, which are easily removed by the ordinary operation of tonsillotomy, are not so frequently encountered of late as during former years. At least such has been my experience, and I believe others in special practice have noted the same change. I presume this is largely due to the fact that, year by year, tonsillotomy is more frequently done by the general practitioner, for the profession, as well as the laity, are fortunately becoming reconciled to the idea that the removal of the tonsils, instead of precipitating all of the evils imaginable, as formerly taught by the good old family doctor, tends, on the contrary, more than most any other operation done, to benefit the general health of the race and even to materially increase the chance of longevity.

With the increasing popularity of this operation, the easy cases, with markedly protruding tonsils, are promptly nabbed by the general practitioner, or when semi-submerged the projecting top is removed, so that after running the gauntlet of the G. P., the poor specialist generally finds in his net only the more difficult cases wherein the tonsil is more or less submerged, or those cases wherein a large, buried base remains after a clever decapitation. This seems to be the most rational explanation as to why the character of this class of cases is gradually changing, and why the pedunculated tonsil of bygone years has now become a *rara avis*.

The ill effects derived from enlarged tonsils are due primarily to their presence as foreign bodies in the throat, which is relatively small as compared with the size of the tonsils, so through the combination nasal respiration is obstructed. In all such cases even a partial removal is of benefit, and will bridge over the trouble for a time. At a later age, as the fauces enlarge, and mayhap the tonsils become somewhat reduced in size, the feature of obstruction to respiration is diminished, though other and equally unfavorable conditions obtain wherein the ears, and the pulmonary and gastro-intestinal tracts are unfavorably affected through mal-secretions from the tonsillar follicles, and associated chronic inflammation of the

* Read before the American Academy of Ophthalmology and Oto-Laryngology at Denver, August 24-26, 1904.

faucial, post-nasal and even Schneiderian m.m., through continuity of tissue is observed. No operation of tonsillotomy will correct these manifestations, and the only relief available will be from a radical tonsillectomy.

In the section of Laryngology and Otology, at the recent meeting of the A. M. A., at Atlantic City, while the tonsil received its full quota of attention, it was an observable fact that the consideration of ordinary tonsillotomy was conspicuous only through its total neglect, and that the trend of the times was to deal with radical removal combined with a passive acknowledgment that the submerged tonsil had come to stay.

The method of operating for the removal of tonsils will necessarily vary in different cases. As before stated, the large and more or less protruding tonsil, with which this paper deals, when in the small throat, should be amputated as thoroughly as is compatible with the conditions present. Probably the most frequently used instrument is the tonsillotome of Mathieu, an evolution of the Fahnestock pattern, which, with others of its class, is designed by means of a pointed or



Fig. 1.—Tonsillotome ($\frac{2}{5}$ size)

barbed elevating mechanism to pull the tonsil through the fenestra, while in its use but little pressure can be exerted upon the pillars. In contrast therewith, the next most popular instrument is Mackenzie's modification of the Physick tonsillotome, which, with others of its class, is so constructed that the important feature in its use consists in pressure upon the pillars, which pressure varies in degree according to the pattern employed and the skill of the operator. In this way the tonsil is made to project through the fenestra, owing to outward pressure upon the adjacent pillars. It will be thus seen that the salient property of the two classes rests respectively in the pull of the first as compared with the push of the second.

In the use of either instrument some operators favor external pressure, which is of necessity but mildly effective in elevating the tonsil, and less efficient with the first class of tonsillotome than with the second. Different operators have furthermore, particularly with the second class of instrument, employed forceps, for pulling the tonsil outward from its bed. In order to depend upon forceps for this purpose some operators have even dispensed with the elevating mechanism of the first variety of instrument. The advantage of the

forceps is that with its use, instead of simply and automatically pulling the tonsil outward, and in one direction only, as is done by the elevating mechanism alluded to, the pull can be so modified and directed that the greatest bulk of the tonsil can be brought within the grasp of the advancing knife edge, and when combined with strong outward pressure upon the pillars, as is best done with instruments of the second class, is of necessity the most efficient method of operating, though one disadvantage in the use of the two instruments conjointly has been that an assistant is generally required in order to keep the tongue down with a depressor.

As better work can be done by not crossing the hands while operating, it is apparent that the two instruments, the forceps and the cutting device, must be changed from one hand to the other, as a change is made to the opposite side after the operation on the side first selected; and right here is where the trouble occurs. Unless the

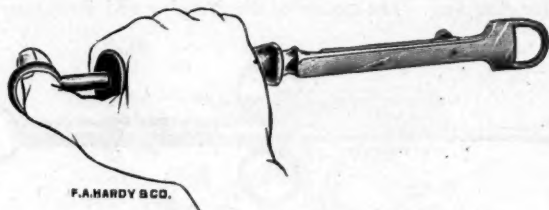


Fig. 2.—Shows how tonsillotome is held for patient's left tonsil.

operator is ambidextrous to a marked degree, and but few are so blessed, he experiences an embarrassment in operating upon the side which comes most awkward for him. As I unfortunately belong to this latter and larger class, I have for some time been experimenting with the idea of producing both a tonsillotome and tonsil forceps, either of which can be used equally well with either hand when one does not possess this rare ambidextrous skill.

I take pleasure in presenting the result of my experiments, selecting the tonsillotome first. For reasons previously given, I have chosen the second type of instrument as my model, and have applied thereto a handle in straight line with the distal end, whereby the greatest outward pressure upon the pillars can be obtained. The cutting end is given a slight curve on the flat, as I have for several years used in a Mathieu tonsillotome,* in order to better conform to the natural curve of the faucial side walls. The cutting blade is spring actuated, so it will automatically remain protected until pressure with

* Annals Otolaryngology and Rhinology, February, 1900.

the thumb is employed. Lastly, the distal end is of such medium size that while the instrument will answer for quite a small child, still it is large enough to allow a pretty large tonsil to be pulled through the fenestra, particularly when the tonsil is firmly grasped by a forceps which will not slip or yield, and with which firm traction can be exerted. A tonsil which is apparently too large for the fenestra will easily slip through it after the attachment to the pillars has been severed. The fenestra in this instrument is somewhat larger than would appear from its cross and vertical diameters, owing to the posterior edge being made without curve, which thereby better conforms to the line of attachment between the tonsil and the anterior pillar. I might add that this tonsillotome is easily taken apart for cleansing.

The tonsil forceps I present is constructed upon an entirely new plan, and is easily operated with either hand for either tonsil. It furthermore, by the removal of a single screw, can be quickly taken apart for cleansing. The motion of the grasping end, in its operation,

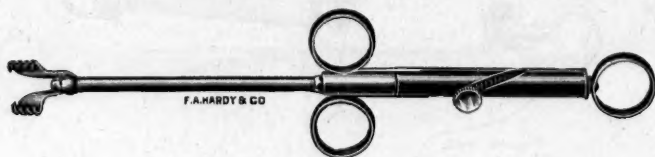


Fig. 3.—Tonsil Forceps ($\frac{2}{5}$ size).

resembles the bite of a bull dog, with spread enough to easily grasp the largest tonsil met with, and yet when closed, while being introduced into the mouth, occupies a minimum of space, and when applied, owing to its slender shaft, is neither in the way nor obstructs the view, and furthermore, like the tonsillotome, is spring actuated to release its hold. In its application, while seizing the tonsil, it is held parallel with the median line, as the teeth of the jaws are parallel with the shaft, but after the grasp, the handle is carried to the opposite side of the mouth, whereby the greatest traction is first exerted upon the anterior edge of the tonsil which is desirable, though, as the incision proceeds rearward, the posterior elevation progresses. In its operation, while making the grasp, the shaft must be slightly rotated to the left, it being held by the operator, as is a Mathieu tonsillotome, with the thumb in the end ring.

The first essential in the operation of tonsillotomy is that the mouth of the patient shall be securely held open with a gag which will not slip, as will most of the gags in use, which generally engage the

molars. Having for some years employed a Ferguson mouth-gag, and having been charmed with its compactness, power and mechanism, I have taken the liberty of so changing it that instead of being held between the molars as formerly, it is made to engage the central incisors, and in place of a lead packing, is furnished with a rubber pad for the teeth, both above and below. With this change its maximum spread is about two and one-half inches, which is much more than is usually required, and it remains exactly where placed, and gives the best possible command of the field of operation.

By engaging the incisors, the point where the teeth are furthest apart, it leaves free at either side the lesser space between the molars, and does not interfere with the heel of the blade of the Mackenzie tonsillotome, nor with the most free lateral motion of any instrument being used. In fact, I cannot see why it should not, with this change, be better adapted than before even for staphylorrhaphy, for which, I believe, it was originally designed.

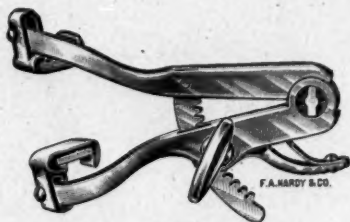


Fig. 4.—Mouth-Gag ($\frac{1}{2}$ size.)

After the adjustment of the gag, the patient is securely held by a trained assistant in the usual manner, while a second assistant steadies the mouth-gag, and forcibly holds the child's head upon one shoulder of the first. The forceps is next passed through the fenestra of the tonsillotome which is thus suspended, with the convexity of the cutting end toward the patient's mouth, as the forceps, while held in the operator's left hand for the patient's left tonsil, and *vice versa*, is made to grasp the tonsil, the tongue meantime being depressed by the free hand of the operator, after which the depressor is removed, and the handle of the tonsillotome properly grasped, when, with the fenestra encircling the shaft of the forceps, the instrument is guided back to the tonsil and properly adjusted with the required pressure, the tonsil meantime being pulled forward through the fenestra, and so rolled or twisted as to bring it entirely outside of the path of the knife, which is then advanced by pressure with the thumb, when the tonsil, with both instruments, is removed. If a

double tonsillotomy is to be done, the forceps is changed to the opposite hand and the steps previously described repeated. Generally speaking, it is better to first remove the tonsil which seems to be the most difficult of removal, provided it is intended to operate both at the same sitting. The tongue depressor shown is the one I have found the most convenient to use in this operation, it being one designed by Dr. A. H. Andrews of Chicago, to which I have added lateral wings bent slightly downward as well as the tip, whereby the tongue is better secured and prevented from slipping to either side.

In case there is an adhesion of the pillars to the tonsil, which must be first severed, an assistant is required to manage the tongue depressor while the separation is being made after the application of the forceps which, in case of the patient's left tonsil, can be done as a step of the operation as described, while, with a right-handed operator, when operating the patient's right tonsil, the separation must first be done as an independent step, after which, by changing the forceps to his right hand, he proceeds as before outlined.



Fig. 5.—Tongue Depressor ($\frac{1}{2}$ size.)

The question of anæsthesia will be decided in each case by the operator. Personally, I am becoming more and more fond of operating without an anæsthetic, owing to the loss thereby of the chief danger of the operation, and feeling that the suffocation incidental to the semi-asphyxiation of the anæsthetic is often of as much annoyance to the little patient as is the operation itself. In those cases wherein a brief anæsthesia will do, and its use is demanded, my preference for nitrous oxide gas is on the increase. In this case, the operation is done in the dentist's chair, at his office, which does away with the requirement for assistants, and incidentally avoids all that preparation before, and cleaning up after, which is necessary when the operation is done in the physician's office. Nitrous oxide anæsthesia, while perfectly safe, is too brief to nicely permit of an ade-

noid operation at the same time the tonsillotomy is being done. With nitrous oxide the gag shown cannot be used, as the anaesthesia mask must tightly cover both mouth and nose; therefore, the dentist employs at first a mouth prop attached to a string, and later another form of gag, quickly applied, with the use of which he is familiar.

The best illumination is given by an electric head lamp, which is far better than a reflector on the forehead, owing to the uncontrollable motions of the patient which, while not marked, are easily sufficient to cause the field of operation to evade the focus of light. Furthermore, the source of illumination, viz.: the lamp, is either too distant or in the way. As a second choice, a large north or east window at the back of the operator, is to be preferred, with the patient facing the light. In fact, the two methods of illumination advised can wisely be used in combination.

Columbus Memorial Building.

A Safety Device for Adenoid Curettes—ERNST URBANTSCHITSCH—
Monatsschrift f. Ohrenheilkunde, April, 1904.

The apparatus consists of a small linen bag sewed into a metal ring which fits into the hollow of the curette. It is designed to catch the adenoid mass, and prevent its falling into the pharynx.

YANKAUER.

**REPORT OF A CASE OF CHRONIC PURULENT OTITIS
MEDIA, COMPLICATED BY CHRONIC MASTOIDITIS,
AND JUGULAR BULB THROMBOSIS—
OPERATION—DEATH*.**

BY JAMES F. MCKERNON, M.D., NEW YORK.
Aural Surgeon to the New York Eye and Ear Infirmary.

My object in reporting this case in detail, is first to insist that when patients are brought to us suffering from a chronic purulent discharge of the middle ear, we point out to them frankly the danger they court by allowing such a condition to exist indefinitely; secondly—that if they refuse to have any save palliative treatment, when in the mind of the surgeon consulted, an operation is distinctly imperative, they be made to accept the responsibility of the future outcome of their condition. Many times we are prone to tell these patients when they consult us for this condition, that they can wait for an indefinite period before resorting to any surgical procedure for a cure, and when we tell them this, I believe we are making a statement that as otologists, we have no right to make; for in doing so, we are advising them, even though it be for a definite period of delay, to still further invite danger, by allowing the disease to slowly but steadily progress and infect adjacent structures, as well as to undermine the general health of the patient. My third reason for reporting the case about to be detailed, is because many of the symptoms developed are unusual and rarely seen when such complications exist as were present in the following:

History. T. K. G., a boy, aged 5 years, was brought to me for examination on Sept. 4, 1903, the mother giving the following history: She said the boy had had scarlet fever seven months previous, and on the eighth day of the fever, he had complained of pain in both ears; which in a few hours was followed by a discharge from both ears. This discharge was quite profuse, contained blood and pus, and continued for a period of six weeks, when the left ear ceased to discharge and had remained well up to the present time. The right ear discharged intermittently ever since, the discharge sometimes very profuse, at other times, scanty. Several times it had ceased discharging altogether for a period of two or three weeks.

* Read at the Tenth Annual Meeting of the American Laryngological, Rhinological and Otolological Society, held at Chicago, May 30, 31 and June 1, 1904.

During the cessation of the discharge the child would be fretful and peevish, complain of headache and the pain would sometimes be referred to the ear. The bowels would be constipated, tongue coated, a foul odor would come from the breath, and the child would be markedly drowsy. After several days of these symptoms, the ear would begin discharging again, at first scantily, and later, more freely, and this train of symptoms would gradually clear up, and the boy would become bright and cheerful and return to a fairly normal condition once more, save for periods of extreme fretfulness and ill temper.

Three weeks after the ears became affected, he complained of pain behind both ears, and this continued for a period of ten days, worse on the right side than on the left. This pain behind the ears had disappeared at the end of the second week, and he had had no recurrence of it since.

Upon examining the ears, a thick, foul smelling yellowish discharge was found completely filling the right external auditory canal; this was removed by syringing, and the canal walls were found reddened and excoriated and somewhat oedematous at the meatus. The lower and anterior portion of the right drum in the region of the Eustachian tube was absent, showing the swollen mucosa lining the inner wall of the tympanum. There was also a large perforation in the posterior superior quadrant, on a level with the short process of the malleus; through this perforation, a granulation, looking almost like a polyp, was protruding. The granular surface was cocaineized, and the probe being passed upward into the attic, revealed roughened bone at two points. There was no prolapse or sagging of the posterior superior canal wall, and no tenderness could be elicited upon pressure over the right mastoid.

The left drum membrane was negative save for a scar in the anterior inferior quadrant, corresponding to the tubal opening in the middle ear. A smear from the right auditory canal was taken, and the infection reported as mixed, with the staphylococcus predominating. The pharynx and naso-pharynx were found unobstructed. The boy seemed well nourished, and his general condition was good, save for a slight anæmia which was present. The temperature registered normal and the pulse was 82 per minute.

A diagnosis of intra-tympanic caries was made, and an operation for its removal advised, which advice was not accepted. The mother said they did not wish to have an operation, as they thought it could be cured by other means, and asked if palliative treatment in the way of syringing, the use of ear drops, etc., could not be used for a time and see what result would be forthcoming. She was told that if

an operation were not done for the removal of the dead bone, the condition would in all probability advance, and later involve other structures; but if she wished to accept the responsibility for the future outcome of the case, that we would see if any improvement would follow the home treatment usually pursued in such cases. Saying she wished this tried first, she was directed to syringe the ear every three hours with a solution of the bichloride of mercury 1-4000, and after the syringing to wipe the canal dry with sterile cotton, and instill into the ear a few drops of a solution composed of boric acid, alcohol and a solution of the bichloride of mercury 1-1000. She was told also that if the discharge diminished, to lessen the frequency of the irrigations, and bring the child to me again at the end of ten days for inspection.

Nothing more was heard from the case for one month, when the mother wrote me saying that to all appearances the ear was cured, as there had been no discharge for over two weeks; and that she guessed I must have been mistaken when I thought I detected dead bone, and asking if under the circumstances I wished to see the boy again. I replied saying I did wish to see him as soon as she could conveniently bring him in from the country, where he lived.

A month later, she brought the boy to me, saying there had been a slight discharge from the ear for three days, but that for six weeks prior to that, the discharge had been absent. Upon again examining the right ear, a thin, scanty discharge was seen coming from the perforation situated on a level with the short process, and the granulation protruding through this opening was somewhat contracted as compared with its size when first seen. The opening over the tube had closed, and the rest of the membrane looked fairly normal, the canal walls were in a much better state than before. The condition was again explained to the child's mother, and she was told that an operation was quite as imperative now as when the child was first seen. She said she would consider the matter, and let me know later about what she decided to have done.

Nothing more was heard of the case for over three months, when the boy was again brought to me by the mother, who said she had now decided to have him operated upon, and wished it done as speedily as possible, as she believed nothing else would cure him. The discharge coming from the ear at this time was very much thicker, had a very offensive odor, was darker in color and quite profuse. There was no change in the canal walls and the condition of the perforation was at last mentioned. Pressure over the mastoid at every point failed to produce the slightest evidence of any involvement. The temperature was taken and registered 99° F. The

boy's color was bad, and altogether his general condition was not as good as when seen three months before.

Two days later he was taken to the New York Eye and Ear Infirmary, and preparations were made for doing a Stacke operation on the affected side. Gas and ether were administered, and the mastoid cortex exposed and found very much darker than usual. The antrum was opened and contained pus; there was also pus present at the tip and in the zygomatic root, both anterior and posterior, and several well developed medullary spaces posterior to the sigmoid groove, contained thick, creamy pus. The bone was soft and necrotic between the posterior canal wall and the anterior surface of the sigmoid groove, and extended downward to the bulb. The posterior canal wall was now removed and a typical Schwartz-Stacke operation done. A small amount of cheesy material was removed from the epi-tympanic space, which upon examination with the microscope later, proved to be pure cholesteatoma. A skin graft was taken from the left thigh and placed over the entire middle ear cavity and mastoid antrum. Owing to the amount of destruction in the mastoid process, the posterior wound was not closed, it being deemed wiser to close it at subsequent dressing at the end of five days or a week.

He was removed from the operating room in good condition, and was in need of no stimulation during the operation or afterward. For the next eight days, he did very well, the temperature ranging from 98.8° F. to 101° F., the latter point being reached twice during this interval, namely the second and sixth days. The wound was dressed twice during this time and found perfectly dry; and the skin grafts had taken over the entire area to which they had been applied. He was bright and cheerful most of the time and did not complain of pain or discomfort.

On the morning of the eighth day, he complained of headache, said the light hurt his eyes, was restless and fretful and the temperature slowly rose to 104.2° F. Just before the temperature began to rise, he had taken some ice-cream which had melted, and said he felt sick at his stomach, and vomited once a small amount of curdy material. The wound was now inspected, and found to be in good condition, he was somewhat drowsy, but rational and complained of feeling hungry.

For the next seven days, there was little or no change from this condition, and you will see from the temperature chart, that at no time were there any marked variations, as a sudden fall or rise. The headache formerly complained of passed away, there was not the intolerance to light that was formerly mentioned, he was bright

and cheerful, wanted to sit up and play, and complained continually of being hungry. During this period of seven days, several consultations were held; one opinion was that we had to deal with a case of typhoid fever of an irregular type, another that it was meningitis, and still another that it was a central pneumonia. The wound was dressed every second day and found in good condition at each dressing. Several blood examinations were made with negative results. Lumbar puncture was done and this was also negative. The eyes were gone over each day, but the field was found clear upon each examination.

On the eighth day following the rise in temperature, he seemed somewhat drowsy, could be easily roused, but wanted to be let alone, and was extremely irritable. The pulse was more rapid than on the preceding days, and when the child was aroused, he complained of pain in the back of the neck and the back of the head, and refused to take nourishment where before he had eaten well. The urine examinations each day resulted negatively.

Permission was asked from the parents to do an exploratory operation, as I believed we had to deal with an intra-cranial condition caused by the previous long suppuration. Considerable delay was experienced in obtaining permission to operate, which was finally granted. At this time, the temperature was 104.8° F., pulse 130 and weak and irregular.

Second Operation. Chloroform was administered, and the bone covering the sigmoid sinus was removed from above the bend of the sinus to the jugular bulb. In removing the bone below, it was found softened, and in removing the bony wall of the bulb, a small cell was found filled with a cheesy material, which upon examination later proved to be cholesteatoma. The dura covering the sinus was dark in the region of the knee, but downward at the bulb, it was of a dark grayish color, and devoid of lustre, and easily compressible. An incision was made from the knee downward for nearly an inch, but no blood followed the incision; a curette was passed into the upper end of the incision and a clot nearly an inch long was removed from the torcular end. This clot was soft and gelatinous, with here and there small grayish particles of plastic material adherent to its surface. After the clot was removed, free hemorrhage was established, and controlled by gauze packing against the lumen of the vessel. A curette was now passed into the bulb, and several pieces of clot removed of a somewhat firmer consistency than that found above. This manipulation failed to establish the blood current below, and as the patient's condition seemed quite as good as when placed on the table, I determined to ligate and resect the internal

jugular vein. This was accomplished as rapidly as possible, and several enlarged lymphatic glands, encountered in the upper third, which were closely matted and adherent to the carotid sheath; these were removed and the neck wound closed with a continuous suture. The dressings were rapidly applied and the patient taken to his room. There was no stimulation necessary during the operation, as the pulse was of good force and regular.

After he was placed in bed, a hot saline solution was injected into the bowel, so as to forestall any sudden collapse. He never regained consciousness and died twenty hours after the operation, the temperature, as you will see, remaining almost stationary up to the time of death. An autopsy was not granted.

To me, this case has been one of extreme interest, for by a close observance of the symptoms presented, it has been my good fortune to see two other cases during the past two months, with a similar history, come to a favorable outcome where an early operation was done, but had I not had the experience in this case, the other cases would in all probability have terminated fatally. It shows that many times our most valuable knowledge is gained from the cases that end in death.

The symptoms as given in the text books today for sigmoid sinus and jugular bulb thrombosis are those to be encountered in typical cases only; and it is the atypical cases that give us trouble from a diagnostic standpoint, similar to the one here reported.

Whether there were any other contributing causes of death in this case, I am unable to say but if other intra-cranial conditions existed, they were obscure, and presented none of the usual signs.

It will be observed that there was no history of a chill or chilly sensations in this case. Two years ago, I reported two cases of sinus thrombosis; one, where the temperature was continuously high, the other where it was continuously low with no evidence of a chill being present throughout the entire course of the disease, although several of the symptoms usually accompanying the disease were present. So in these cases, we should not always look for and expect to find typical symptoms, for if we fail to find them, we are generally misled. When a pronounced chill does take place during the course of this disease, it simply means that a certain quantity of the infective material is thrown into the general circulation, and is of the virulent type; whereas when no chill is present, the infection is not so poisonous, and the system more easily cares for it.

In closing, I wish to sound one note of warning in our cases that are of the atypical type. That is, that when the patient is not progressing favorably, and all other conditions have been eliminated, we should not allow too much valuable time to elapse before we come back to the original focus of infection to find the cause of our trouble, for I believe that here, in the majority of our cases, will be found the chief etiological factor.

62 West 52nd Street.

THE TYMPANO-MASTOID OPERATION IN CHRONIC SUPPURATIVE OTITIS MEDIA.*

BY ALBERT H. ANDREWS, M.D., CHICAGO.

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In talking with those who treat the ear and in looking over the literature of suppurative otitis media one is impressed with the number of different plans of treatment recommended and the great variety of medicinal agents in the success of which their respective advocates seem to have implicit confidence. That many cases of chronic suppuration even of long duration, are cured by these so-called conservative methods is well known to all. That many cases have been treated by such methods for a long period of time and still continue to discharge, is equally well known. The great majority of cases found in the latter class undoubtedly accounts for the belief found both among the laity and among physicians that little or nothing can be done for discharging ears. When a patient with a chronic suppurating ear applies for treatment the first question to decide is not what remedy to use but whether this is a case for conservative or surgical treatment.

As our diagnostic ability increases our reputations will suffer less from unsuccessful attempts to cure surgical cases by non-surgical means. In the present state of our knowledge it is not always possible to determine at the first examination in which class a given case belongs.

The pathologic conditions which nature cannot be expected to correct without the help of the surgeon may be enumerated as follows: 1. Bone necrosis either in the ossicles, attic, antrum, or mastoid. 2. Granulations or polypi within the deeper cavities of the middle ear. 3. Osteosclerosis of the mastoid. 4. A lining of the deeper cavities of the middle ear with epidermis either with or without cholesteatoma. Sometimes only one of these conditions is present; again all may be found in a single case. Sometimes the surgical cause of the suppuration is easy and sometimes difficult of recognition. When a surgical cause for the continued suppuration cannot be discovered it is perfectly proper to treat the case conservatively until it is cured, or until it becomes apparent that there is some condition present which will require radical measures.

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The treatment of chronic suppurative otitis media may be classified as: 1. Mechanical, including attempts at cleansing and drainage of the cavities of the middle ear. 2. The use of medicinal agents supposed to have germicidal or healing properties. 3. The use of internal remedies either for building up the general health of the patient or for their more direct effect upon the suppurative process. 4. The surgical treatment which includes the removal of granulations or polypi from the auditory canal and middle ear, enlarging the perforation to secure better drainage, ossiculectomy, the removal of the plate of bone between the attic and the inner end of the auditory canal, and the radical or tympano-mastoid operation.

As distinguished from the ordinary mastoid operation the tympano-mastoid includes not only a clearing away of all diseased tissue within the mastoid process but the removal of the posterior and superior wall of the auditory canal, removal of the drum membrane, malleus and incus together with the outer wall of the attic. This turns the mastoid, mastoid antrum, attic, middle ear, and auditory canal into one cavity which is expected to become lined with skin.

When to undertake the tympano-mastoid operation for the relief of chronic suppuration is a question which must be settled upon its merits in each individual case, but as a rule such an operation should be resorted to in all cases which cannot be cured by less radical measures. As exceptions to this rule may be mentioned those suffering from well-advanced pulmonary or other organic disease, and the very aged who have had suppurative otitis media for a long time without apparent inconvenience.

In addition to the continued discharge after other plans of treatment have been thoroughly tried, persistent odor is a special symptom pointing toward the necessity of radical operation. Odor means decomposition, and decomposition means accumulation, and accumulation means failure in the efforts to drain or disinfect the deeper parts of the middle ear. So when a short course of treatment fails to relieve the odor it should be considered an unfavorable indication.

Pain in the ear, in the mastoid or in the side of the head may be slight or severe, may be continuous or intermittent. When present it points toward the necessity of an operation but the absence of pain is by no means an indication that a radical operation may not be required. The same may be said of temperature although it is the rule for patient with chronic suppuration especially with odor to have slight elevation of temperature at some time during every twenty-four hours. Tenderness upon pressure over the mastoid as a symptom is unreliable since it is found when the mastoid is not dis-

eased and may be absent when the entire mastoid is necrotic leaving only the outer table intact. However, as a general indication tenderness on pressure when taken with other symptoms points toward surgery.

When auscultation of the mastoid by means of the stethoscope and tuning fork shows any change in the normal density of the bone it is additional evidence of the necessity of operation.

The discovery of necrotic bone in the mastoid or deeper parts of the middle ear is a positive indication for the operation. When the perforation is of sufficient size necrotic bone may be searched for with a probe or the washings from the ear may be filtered and the debris examined with the microscope for bone cells. When the discharge is slight and evidence of necrosis is found in the ossicles the ossicles may be removed. The prognosis in such cases is fair, but unless great care is used in the selection of cases for ossiculectomy the results will be disappointing, as many of the cases will either not be cured or will later submit to a more radical operation.

A sinus is frequently found in the posterior wall of the auditory canal leading back into the mastoid. The mouth of the sinus is usually marked by a small mass of granulations though sometimes the granulations will take a polypoid form and entirely fill the auditory canal. After the granulations have been cleared away a bent probe can be passed into the sinus when its real character will be revealed. Such cases may pass for ordinary suppurative otitis media even when the drum membrane is intact and the middle ear is practically normal. When such a condition is present it is useless to waste time with non-surgical measures.

When masses of exfoliated epithelium or cholesteatomatous masses come from beyond the cavity of the middle ear proper it is useless to delay operation in the hope of a cure by the ordinary plans of treatment.

The direct objects of the operation are: 1. The removal of all diseased tissue. 2. To provide for free and permanent drainage. 3. To improve the hearing when it is possible. 4. To relieve the patient of the menace to his health and life which the presence of pus in his ear continually subjects him.

There are certain dangers connected with the operation which should not be under-estimated. Probably the greatest danger with the majority of operators is the negative danger that the operation will not be thoroughly done and hence fail to bring about a cure. The direct dangers are: 1. To the facial nerve. 2. To the horizontal semi-circular canal. 3. To the lateral sinus. 4. To the

middle fossa. 5. To the internal ear by accidental removal of the stapes.

Probably the greatest of direct dangers is facial paralysis from injury to the seventh nerve. Much has been written regarding the location and course of this nerve and many rules have been given for preventing injury to it. In the writer's judgment there is but one rule worthy of consideration for preventing injury to the nerve as well as to other important structures and that is to know where they are and keep away from them. The only practical way of becoming familiar with the location of these structures is by a study of the surgical anatomy of the temporal bone on the cadaver. Cadaver experience is more necessary for the skillful performance of this operation than for any other operation on the human body. In other operations the important structures can be seen or felt and then let alone, while in the tympano-mastoid operation to see is to destroy; hence the necessity in this operation of having the location of the structures clearly in mind and of being able to go close to them without causing injury. In no other part of the human anatomy are so many structures essential to the life, health and comfort of the individual found in so small a space. After having done secondary operations on a considerable number of cases where the first operation had failed to cure and after seeing many cases in which accidents had occurred, the writer is firmly convinced that no surgeon has any right to undertake a mastoid operation, except in an emergency, until he has prepared himself for such work by repeated operation on the cadaver. In cadaver work special attention should be given to the location of the nerve and horizontal semi-circular canal for it is usually fear of injuring these structures that accounts for the lack of thoroughness in operating which is necessary to bring about a cure.

When the nerve has been injured facial paralysis promptly proclaims the fact, but when the horizontal semi-circular is injured the symptoms produced are much the same as when the stapes is accidentally removed, viz., greatly impaired hearing and more or less persistent dizziness. The semi-circular canal lies immediately below a smooth rounded bony eminence in the floor of the mastoid antrum. In necrosis of the antrum this area is rarely affected, but in removing necrotic bone the eminence has been frequently removed either exposing or taking out a section of the canal. The discomfort to the patient from this accident is sometimes comparatively slight but in many cases the disturbance of equilibrium persists for months or years. Cases are reported in which by secondary operation the injured canal has been covered with a skin graft with complete re-

lief from the dizziness and return of the hearing to normal. In the cases of spontaneous relief from the deafness and dizziness it is probable that in the healing process the canal has been covered over and is protected by newly formed tissue. One suggestion regarding the location of the facial nerve if kept in mind will greatly lessen the danger of injury. The nerve lies in a canal, (sometimes in a groove,) in the inner wall of the middle ear just above the oval window and at the posterior border of the middle ear it turns directly downward (not outward) and emerges from the skull at the stylo-mastoid foramen. The nerve never lies external to the attachment of the posterior margin of the drum membrane. Facial paralysis sometimes follows the mastoid operation when the nerve has not been exposed. In other cases the nerve has been exposed either accidentally or intentionally without paralysis resulting. In two cases of facial paralysis from acute mastoiditis previous to operation prompt recovery from the paralysis followed operation with exposure of the nerve. It seems not improbable that concussion due to the vigorous use of the mallet may account for paralysis in some cases especially those in which the paralysis disappears in a few weeks. If a thin sharp chisel or gouge is used the hammering will be much lighter and the danger from this source will be materially lessened.

The question of what disposition to make of the skin of the posterior wall of the auditory canal is still the subject of much discussion. The method employed by the writer in the past few years is to make a tongue shaped flap of the posterior superior skin wall of the canal. This is done by making two parallel incisions through the entire length of the canal, one corresponding to the upper margin and the other to the lower margin of the bone removed from the wall of the canal. This tongue-shaped flap is turned backward and is caught and held in place by one of the sutures closing the post auricular incision. If the two incisions making the tongue-shaped flap are carried well out into the auricle and the soft tissue and cartilage when necessary removed from the back of the flap it gives the surgeon complete control over the size of the external auditory meatus.

A large meatus with free access to the mastoid cavity by complete removal of the posterior wall of the auditory canal makes immediate closure of the post-auricular incision a safe surgical procedure. When this plan is adopted the after dressing is conducted entirely through the meatus. The head bandage can usually be left off after ten or twelve days and frequently the patient returns to his work in two weeks. It is necessary to continue the after treatment until the cavity becomes dry and is completely lined with epidermis. It is true that some surgeons who once used the immediate closure

plan have abandoned it and now leave the wound open behind the ear. Inquiry has convinced the writer that their method of disposing of the posterior wall of the auditory canal did not give these surgeons free permanent drainage and perfect access to all parts of the operation cavity. During the healing process the cavity must be frequently inspected and exuberant granulations kept down either by cauterization or removal. Their removal can be accomplished by means of the sharp curette or the angular ear polypus forcep. When these granulations are permitted to form they keep the cavity from becoming lined with epidermis and thus indefinitely prolong the healing process. When they form and are allowed to remain on the inner wall of the middle ear proper they impair the hearing by preventing sound waves reaching the internal ear.

The prognosis as to hearing after the tympano-mastoid operation is often a serious question. When the function of the internal ear is normal and the granulations can be kept away from the wall between the middle and the internal ear the patient ought to be able to hear an ordinary whisper three or four feet away. When before the operation the whisper can be heard more than three feet no improvement should be promised, but when the whisper can be heard less than three feet, if bone conduction is good, it is safe to state that the hearing should be improved.

In cases of operation for acute exacerbation of a chronic otitis or for any condition of the mastoid or brain which has been preceded or brought about by a chronic otitis, the question of tympano-mastoid operation should be carefully considered. The ordinary mastoid operation may relieve the immediate trouble but frequently it does not stop the chronic discharge nor prevent a recurrence of the acute condition. Permanent relief in many of these cases can only be secured by thoroughly cleaning out both the mastoid and the middle ear.

In the time allotted a detailed consideration of the various aspects of the tympano-mastoid operation for the cure of intractable suppuration is impossible. The tendency of otologists in these cases is toward more radical measures and the profession generally is becoming cognizant of the fact that the cases which do not respond to cleansing medication and capillary drainage can be cured by the tympano-mastoid operation.

100 State St.

"SOME EXPERIENCES WITH ADRENALIN CHLORIDE."*

BY D. EMMETT WELSH, M.D., GRAND RAPIDS, MICH.

Case I. I was consulted Feb., 1904, by J. B., aged 19, on account of a growth on the ear. The boy in appearance was robust and healthy and gave a good family history. The growth was located on the lobe of the left ear, filling the concha, partially occluding and extending into the external auditory meatus. It was nodulated in form, very hard on pressure, though not painful, and vascular. A section was taken and the microscopic findings proved it to be a myxo fibroma and an early operation advised. The patient was taken to Butterworth Hospital and prepared for operation.

The urine by analysis was normal, the lungs normal and the heart in sounds, size and position normal. The patient in appearance was strong and robust and physical development perfect.

Chloroform was the anæsthetic used. During its administration there was no evidence of excitement or impairment of respiration. The anæsthetic was taken easily and administered slowly. When narcosis was produced I injected into the growth thirty minims of a solution of chloride of adrenalin. To-wit: Chloride adrenalin dram 4, sterile water dram 4.

The growth was so dense and hard that my needle bent and it was with difficulty that I could force the fluid into the tumor. The attempts were made at different points of the tumor and three were made before I used the above quantity.

During this time the anæsthetic was being given and the patient was looked after by the anæsthetist. After injecting the tumor I turned from my patient, laid the hypodermic on the instrument stand and on returning to my patient I noted the tumor was blanched, a bluish discoloration on the cheek, the lips cyanosed, the pulse could not be found, respiration had ceased—my patient was dead. In this short space of time probably one half minute to a minute had elapsed in turning from and to my patient. No symptom was noticed by the anæsthetist.

The conditions noted came so suddenly that the respiration and heart action seemed to cease simultaneously. All forms of resuscitation were resorted to but without avail. I did not conduct an autopsy, but I was informed by those who did hold one that they could not find any lesions. I contented myself that death was due

* Read at the Ninth Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology, held at Denver, Colo., August 24, 25 and 26, 1904.

to the chloroform and would so continue to believe had not a second case presented itself and alarming symptoms occurred without the fatal results.

Case II. Katie C., aged 18, presented herself for examination on account of a marked exophthalmic condition of the left eye. The examination showed it to be and the microscopic findings proved it to be a sarcoma—round cell variety.

An exenteration of the orbit being always very bloody I concluded to use the chloride of adrenalin. Chloroform was the anæsthetic used. I injected sixty minims of an equal part solution of chloride of adrenalin and sterile water into the orbital tissue. I then enucleated the eyeball with a small loss of blood. Wishing to control the hemorrhage still more, I saturated a pledget of cotton in the above solution and pressed it into the orbit. Probably one half to one minute thereafter, respiration ceased, the patient became pulseless, the lips slightly cyanosed and a bluish spot showed on the cheek similar in appearance to the former case.

The patient's head was lowered and a cold towel made to strike over the præcordia, artificial respiration instituted. Fortunately in a short time my patient revived and I finished the operation, which was comparatively bloodless.

This patient took the anæsthetic very well without excitement or disturbed respiration.

I cannot tell whether the solution of chloride of adrenalin was made by P. D. & Co., or Armour & Co. The question arising in the first case might be dispelled by the chloroform alone, but the second case following so closely and under conditions somewhat similar, make it an important factor.

I am unable to find any literature on the subject of chloride of adrenalin and its truly beneficial results except from the manufacturers, but this experience has made me cautious as to its indiscriminate use as to strength and quantity.

In these cases respiration and heart beat seemed to cease simultaneously. From its reported heart stimulating effect one would infer there was no danger from its use and particularly in anæsthesia and I have noted its recommendation as a stimulant in the depression of chloroform and ether.

I have been informed by P. D. & Co., that 1 minim of the solution of 1 to 1000 is equivalent practically to one-half grain of the fresh suprarenal gland. As we must take it for granted this being entirely correct, in my first case 30 minims being used there was contained in this hypodermic medication seven and one-half grains of fresh suprarenal gland; while in the second case fifteen grains were used with an additional amount absorbed from the pledget of cotton packed into the orbit, and of that I cannot judge. Prior to this experience I have used it full strength, locally and hypodermically, but since then I am using it in one drachm to the ounce and with good and no unpleasant results.

PURULENT OTITIS MEDIA COMPLICATING TYPHOID FEVER.

BY EWING W. DAY, M.D., & CHEVALIER JACKSON, M.D., PITTSBURG, PA.

(Continued from the November, 1904, number.)

That efforts at blowing the nose and hawking are factors is doubtful, for purulent otitis media occurs almost exclusively in the severe typhoid fever infections, and these do not blow their nose, or hawk. The toxemia is too great. In fact it would seem that the lessening of the impulse to hawking and of the reflex coughing permits accumulation of mucus in naso-pharynx. The mucus may be purulent from local inflammation or may be infective by reason of pus organisms collected from the inspired air. A longer sojourn than in the normally active naso-pharynx permits of incubation until a virulent, often a pure culture fills the naso-pharynx ready for aural invasion.

As to weaker ciliary activity it is a probability not proven.

The lessened resistance of the tissues in typhoid fever was demonstrated by Brieger and Ehrlich. Malignant edema followed the injection of a solution of musk in typhoid fever patients, but was harmless in others.

Liebermeister, years ago, wrote, "If one studies closely the manifold complications and sequelæ of typhoid fever, in the living and at autopsies, he will receive the impression that in severe cases the resistance is reduced to the minimum in all organs without exception, and that there is an extraordinary tendency to the destruction of the tissue." This expresses the clinical aspect of the predisposing factors. It is a condition probably brought about by the action of the toxins on the tissue cells and juices. This fact was not proven. It is given tentatively for future observations to prove.

(6 and 7). Tubal closure with its attendant congestion of tissue and exudation might, *a priori*, be deemed a factor. The condition of the tube, however, could only be determined positively by catheter inflation, and this did not seem a justifiable procedure in a disease with so many middle ear infections probably occurring per tubam. Nevertheless, the tube was tested and found patulous in all of 12 cases, more so than normal in ten of them. It was seen to be patulous in 6 suppurative cases by the pus oozing from the tube mouth in the naso-pharynx.

Ulceration of the mucosa of the tube mouth was found in four cases, all of which were followed, (not preceded) by purulent otitis. All unilateral. All started with a superficial gray slough, as if brushed with dilute silver nitrate solution. This deepened to a swollen ulcer with raised edges. In all three cases otitis developed within a week (third, fifth and seventh days respectively.) It ran a mild course and did not have the fulminating character seen in the cases believed to be due to embolism or thrombosis. In two of the cases, detached patches of the same gray slough were seen on the tympanic mucosa. They were detached and their entire circumference could be seen, so that they could not have been continuous with the tube mouth patches. The latter evidently arose from true typhoid infection in the glandular structure of the tube mouth (tonsil of Gerlach). It proceeded in one case so deeply that a perichondritis tube resulted. The entire eminence became swollen to the size of a walnut, its mucosa highly edematous. Cartilaginous necrosis followed and part of the eminence sloughed off, leaving finally a pinhole tube orifice, with only a slight wrinkled elevation where the tubal eminence had been. This case had a mastoid empyema complicating the otitis on the same side as the tubal trouble. The start toward recovery of the tubal condition set in immediately after the mastoidectomy.

8. The severity of the typhoid fever infection is undoubtedly the most important factor in the production of purulent otitis.

Under the head of frequency, it was mentioned that inquiry among physicians in general practice developed the fact that those practitioners in the poorer districts occasionally saw cases of purulent otitis media, while those practicing among the wealthy class never saw even one case. The reason for severe cases in the poorer districts seems to be the continuance at labor in the earlier stages (some men working with a temperature of 103) and at the same time eating a general diet, often forcing food down in spite of anorexia, in the ignorant hope of keeping up the strength. Many laborers will make an untreated walking case out of conditions that would put the wealthier man in bed with bi-daily visits of the physician, and the constant attention of two trained nurses to enforce dietary and other restrictions and a proper regimen.

In our own cases it was noticed that out of 88 cases of purulent otitis, 71 (80.7%) occurred in cases in which the temperature exceeded 104.2 every day for a week or more, and in 30 (34.1%) the temperature reached 105. All other symptoms in a fair proportion of the cases kept pace with the temperature as indications of the severity of the case. No case of otitis occurred in any case in which

the temperature did not exceed 102. In considering the temperature it must be remembered that except in cases not thought to require it the patient was sponged every time the temperature rose above 103. Wet packs and ice packs were used, if sponging failed to bring the temperature down.

10. That a perforation might admit infection seems plausible, yet our observations showing the external canal to be sterile would indicate that for infection to take place either infected fluids or strong currents of air would have to find their way to the fundus of the canal.

The previous aural history was usually unobtainable and was always unreliable when negative. Unless bilateral, ear disease among this class of people is usually disregarded and forgotten. Inspection, however, yielded accurate results in many cases.

A pre-typhoid chronic catarrhal otitis including sclerosis was observed in 21 cases, (7.5%). Of these one developed a purulent otitis in his normal ear, and one other case developed it in his catarrhal ear. This is of course negative, as in that month 10% of all the typhoid fever cases were having suppurating ears.

A chronic purulent otitis existing at the onset of the typhoid fever was always followed by an acute exacerbation, and this exacerbation, like the cases of primary acute otitis, occurred not earlier than the 10th day, and in three cases, not until the third week. The cases with pre-typhoid chronic purulent otitis differed in character from the primary cases. They discharged less and the discharge contained no blood or serum. They ran a milder course and did not seem prone to develop mastoid abscess. This milder character might bear on the etiology in various ways. Were the bacteria present, or was the granulation tissue resistant to a new infection of the type seen in the acute cases? Or does it only argue the existence of a predisposition to pus formation resulting in an acceleration of the pyogenic process already present? If this be so, does it not seem to argue that the other cases were embolic or thrombotic, while these few cases of chronic otitis escaped thrombosis?

(12) Anemia of the vascular tissue of the nose widening the air channel was present in practically all of the severe cases and seemed a part of the general emaciation. It showed most markedly in the third week and afterward; the period when most cases of otitis develop.

(13) The efficiency of a draught of air in the production of otitis would seem questionable if it were not for the constant presence of moisture on the skin. Just what way the chilling of the surface from the wind blowing on this moist surface might

differ physiologically from the chilling of an ice pack, the writers are not prepared to say. However, we note that the wet pack or ice pack is used during pyrexia, while the most frequent occurrence of purulent otitis is later when the temperature has reached normal.

(14) It is Dr. John W. Boyce's practice to omit sponging in certain cases, no matter what the temperature.

He also does not advise the ice pack. He stimulates and feeds sparingly. This affords an opportunity for observing the effects of hydrotherapy including ice packs. Other members of the staff feed and stimulate more freely, the stimulants being chiefly strychnine and whiskey, and some of them use ice packs freely. Various drugs such as acetozone and guaiacol were tried extensively by Dr. Lawrence Litchfield. Some patients liked an ice bag on their heads and were allowed to have it constantly, while others objected to it and it was not used.

Detailed tables would be too voluminous, but the result of our observations of all these differences in treatment and management lead us to conclude that hydrotherapy, including ice pack, and head ice bags (tubbing not being used) drugs, including stimulants, and foods and feeding are absolutely negative as etiologic factors in purulent otitis. Quinine has been considered a factor in the etiology of purulent otitis in typhoid fever. But today when this complication is commoner than ever, quinine is never used in antipyretic doses.

(16) *Age.* The age of the patients ranged from 16 to 55 years, but 71% of them were between the ages of 20 and 30 years.

(17) *Sex.* In the female wards eight cases of purulent otitis media developed in 106 cases of typhoid fever, (7.5%.) None of these cases developed a mastoid empyema. In the average the typhoid fever cases in the female wards were of a less degree of severity than those in the male wards; probably on account of the earlier taking the bed in the initial stages. As this simply brings us to the severity of the general infection, it cannot be said that sex is a factor.

(18) The bearing of nativity on the etiology is interesting. Of 89 otitis cases, the following were the nativities:

Austro-Hungary	35
Greece	1
Ireland	3
Italy	25
Poland	6
Russia (southern)	10

Russia (northern)	1
Slavonia	4
Syria	1
United States (negroes)	3

Of 30 mastoid cases, only two spoke English and those were of Irish birth.

The writers could not obtain the nativity of all the typhoid fever cases, but the United States was well represented, as almost every other large country, yet the purulent otitis seems to have occurred almost exclusively in the races of Southern Europe and Asia.

This preponderance of foreigners is due to the fact that for reasons before explained they have more severe typhoid fever infections, and this means more liability to purulent otitis, a more severe otitis, and a greater probability of mastoid empyema. The lack of cleanliness may also be a factor.

(19) Occupation records did not give data of any value for the reason that laborers so enormously preponderated that there were not enough of other occupations to figure percentages on. In the female wards, domestics preponderated, but there were not enough of even these to draw conclusions.

(20) Impacted cerumen was found in, and removed from, 18 ears out of 288 cases of typhoid fever examined. As only one of the 18 cases, and that only a slight impaction, developed otitis, no causal relation could be traced.

(21) Associated diseases of the nose and throat: These may be classed into typhoid and pre-typhoid, according as they developed during the typhoid fever or preceded it. As to the pre-typhoid 48 different pathologic states and deformities of the nose, naso-pharynx and pharynx were found as follows:

Adenoids	2
Naso-pharyngeal Bursitis (Tornwaldt's disease) ..	1
Tonsillitis, chronic, follicular	12
Tonsillitis, acute	1
Tonsil hypertrophied	18
Naso-pharyngitis, chronic	62
Naso-pharyngitis, ulcerative specific	2
Pharyngitis, chronic	62
Pharyngo-mycosis	1
Naso-pharyngeal neoplasm, fibroma (?)	1
Trachitis	26
Laryngitis, chronic	18
Laryngitis, ulcerative specific	2

Laryngeal paralysis, unilateral, abductor.....	1
Septum, deviation of	54
Septum, ulceration of, specific	1
Septum, spur of	22
Rhinitis, hypertrophic	71
Rhinitis, atrophic	2
Frontal Sinusitis, acute with empyema	2
Sinusitis, chronic	1
Ethmoiditis, chronic	5

As to the associated lesion of the nose and throat, that in all probability developed during the typhoid fever, the following were found in an examination of 280 cases:

Rhinitis purulent	13
Rhinitis catarrhal	72
Rhinitis ulcerative typhoid	6
Naso-pharyngitis	234
Pharyngitis	198
Thrachitis	52
Laryngitis	207
Tracheal perichondritis	16
Laryngeal "	8
Purpura of nasal mucosa	6
Purpura of naso-pharyngeal.....	2
Purpura of pharyngeal	3
Purpura of laryngeal.....	
Septum, perichondritis of typhoid	2
Septum, perichondritis of specific.....	1
Granular swelling and localized soft hypertrophies in naso-pharynx	3
Anemia of nasal mucosa, with the dried secretion giving appearance of atrophic rhinitis.....	62

EXCITING FACTORS.

1. Extension by continuity of tissue may have occurred in the tubal cases before recited, though the writers doubt it. If it did not occur here, there was certainly no evidence of its having occurred in any other cases.

2. Infection by way of the external canal:

In the bacteriological examinations here recorded every canal proved sterile close to the drum membrane. Manifestly infection did not occur by this route. In cases before mentioned, the canal was found sterile a short time before the purulent otitis developed.

As a sample of hematogenous infection the case reported by

Seidle is interesting. A typhoid fever case was complicated by mastoid empyema, axillary and temporal abscesses; all secondary to a liver abscess which developed on the 23rd day of typhoid fever.

We come now to consider the time-honored theory of ear infections, namely, infection by means of an infective mass passing up by way of the Eustachian tube, (not by extension of an infective process by continuity of tissue). We must not make the mistake of supposing that if the ear condition be a true typhoid fever process due to bacillus typhosis, that the bacillus necessarily reaches the ear per tubam. It has been found in tissues and organs remote from the alimentary or respiratory tracts, and not open to air borne infection. The conclusion is that it is carried by the blood, and there is no reason why it should not be so carried to the ear. Hewlett found 83 typhoid fever cases to have bacillus typhosis in the blood.

As to whether the middle ear conditions be an infection per tubam, the evidence seems to be that it is in the mild cases. As above recorded, pus was present in the naso-pharynx in all cases before the onset of suppuration. In every case examined after the onset of purulent middle ear inflammation, pus was found abundantly in the naso-pharynx. This was thick and ropy while the ear discharge (at that stage) was thin and bloody, so that the reverse order of things (tubal drainage of tympanic discharges) was excluded. We exclude here a number of cases where pus did not drain from the ear into the naso-pharynx. Tubal closure as a cause may be excluded because there were practically no closed tubes noted. In fact some tubes may have been too permeable, thus facilitating infection. Extension per tubam by continuity of tissue is probable. Extension by forcing bodily of a mass of infective material during sneezing, vomiting, coughing, swallowing, etc., is probable. Both of these probabilities are like the legal illustration of the value of circumstantial evidence: We see the puff of smoke from the revolver, hear the report, see the victim drop with a bullet hole in his body, and later, at the autopsy, the bullet is found. Nobody saw the bullet go. So it is with this. We certainly have the infective material at one end of the tube and an infective process later starts at the other end. It seems plausible that it gained access through the tube.

Dr. Thomas Arbuthnot, in searching for the source of infection erysipelatous and purulent, found the sterilization of bedding thoroughly defective, through the inefficiency and carelessness of a conscienceless employee, so that the pillows were at one time not really sterilized, simply recovered with clean linen cases. This seemed to account for three series of cases we had previously recorded. One bed had four consecutive purulent otitic complications in its typhoid

fever occupants; another bed had two consecutive cases and the third bed had two consecutive cases, an intervening uncomplicated mild case of typhoid fever, and then another purulent otitis. In all these instances the first cases were fulminating, the later cases mild. This is a remarkable observation and points to the two types of purulent otitis, fulminating and mild being due to different causes, and very plausibly to embolism in the fulminating and infection in the mild cases. As to the route by which the infection reached the ear, it must have been by way of the nose and naso-pharynx, as the external canal was found sterile close to the drum membrane.

In one instance three cases of purulent otitis occurred in adjoining beds in one, two, three order, two and three days, respectively, apart. The means of infection could not be traced unless it were from drinking out of each other's vessels, by turning over to the neighbor's table, which stood on the other side from the patient's own table.

As to the infection by way of the lymphatics and by the petrosquamosal fissure, we saw nothing on which to base a statement.

(3) Bezold reports finding in one case, post mortem evidences of extensive middle ear sloughing from the occlusion of the principal arterial blood channels of the middle ear by emboli.

The application of this hypothesis to the etiology of middle ear suppurations, harmonizes with all the observed phenomena, such as prompt rupture of the membrane, copious sanguinolent serous discharge becoming rapidly purulent in spite of efforts at asepsis and antisepsis, extremely sudden onset without previous catarrhal symptoms, etc., characterizing the cases of fulminating type.

Embolism of the auricular artery or its branch the stylo-mastoid or of the tympanic branch of the external maxillary or of the superficial petrosal would account for the fulminating cases. Anastomosis is very free, however, and perhaps in the adult the stylo-mastoid is the only one whose embolic occlusion would so deplete the tympanic mucosa as to render it necrotic or open to bacterial invasion. The chief defect we find in this theory is that the stylo-mastoid artery supplies a considerable extent of the neurilemma of the portio dura, yet no disturbance of the innervation of the muscles it supplies was noticed. Another point we would make is that the stylo-mastoid is not a "terminal artery" and thus not subject to infarct, as for instance the lungs and kidneys are. Still clinicians often see cases in which temporary or permanent low resistance added to impeded, but not occluded, circulation, will result in tissue necrosis.

Further, if we accept the embolic theory (a proven fact only in Bezold's solitary case) we must demonstrate an original source from

which the emboli break away. This implies an endocarditis or an infective pus focus in the peripheral circulation. Endocarditis was rare, but pus foci were numerous, though they could not always be proven to exist prior to the ear affection. Frequently, however, they were found so shortly after the ear affection that it seemed justifiable to consider the remote pus focus primary, though not sufficiently manifest to be discovered until after the ear discharge, which was noted within a few minutes of its appearance by nurses by residents or nurses. We acknowledge the deficiency of our statistics in regard to the number of cases of endocarditis.

Pus foci remote from the ear and occurring prior to the ear trouble were found in six out of 38 (15.8%) mild ear cases and in 42 out of 50 (84%) fulminating cases. Most of these were in the lungs and bronchi though a few occurred in locations where an embolus could not reach the ear without first passing through the lungs, a manifest impossibility, unless of bacterial size, followed by increase in size after passing. It seems plausible that the ear lodged embolus might be from an infective focus in the lungs this in turn arising from the enteric lesions; the lateness of onset point to this. It is to be regretted that autopsies could not be obtained in the few cases that died just in the incipency of the fulminating otitis. Four deaths occurred at this stage, one from pneumonia, one from hemorrhage, two from perforation. It would have been interesting to search for infarcts elsewhere, as well as to examine locally. We trust this may yet be done by ourselves or some one else. While unable to bring forward post mortem evidence we believe that primary thrombosis, independent of embolism may be the exciting cause of the fulminating type of cases.

In other words, we consider it possible that the fulminating type of purulent otitis media cases, may have a pathology similar to that of leukophlegmasia.

One very stubborn argument that can be brought against every factor above enumerated is that purulent otitis media is more common now than ever. This would seem to require the finding of a cause operative now that did not exist before. The chief change has been in three things. Hydrotherapy is more extensively used; ventilation with draughts is more common, and there is a change in the nativity of the foreigners who fill our hospitals. They used to be Irish and Germans with a sprinkling of Scotch and English. Now they come chiefly from Asia and the South of Europe. This population is of excessively dirty personal habits, compared to our laboring class. It is remarkable, as before stated, that while the typhoid fever cases included every nationality, the purulent otitis cases oc-

curred almost exclusively in natives of Southern Europe, and were the severe cases of typhoid fever.

SYMPTOMATOLOGY.

According to our observations there are three distinct types of purulent otitis media in typhoid fever, the hemorrhagic, the slow and the fulminating. In some cases of the hemorrhagic type, the blood filled the tympanum, causing pain until incised—other cases started as hemorrhagic blebs which were merged. Both types soon became purulent. The slow type does not differ materially from acute otitis as we usually see it, except in so far as it may be masked by the general malady. It is apt to be acute catarrhal at the onset, and become purulent later. Occasionally it seems purulent from incipency.

The presence of pain depends upon the degree of toxemia. If the patient be profoundly toxemic, the discharge will be the first symptom, unless the ear has been watched daily. If the patient be not stupid from toxins, he will complain of pain for several days, when there will seem to be fluid in the tympanum, though the membrane will not be bulging much, if any. If not incised, it may not burst for a week after the onset. The appearance of the drum membrane does not differ from that of acute otitis. One difference is marked, however, namely, after the membrane is perforated by rupture or incision, the discharge will invariably become purulent in spite of the most earnest efforts at asepsis. The fulminating cases are of an entirely different type. The onset is exceedingly sudden. In ten cases no inflammatory phenomena were present 24 or 48 hours previous to spontaneous rupture of the membrana tympani. Upon examination, the drum membrane was found intensely red, a large perforation occupying most frequently the posterior inferior quadrant. Though it could be seen a swollen, deep red, hemorrhagic mucosa. Here was an intense otitis media purulenta fully established, with extensive pathologic change in an ear quite normal, or at least quite free from inflammation, in some instances 24, in others 48 hours before. Possibly, the time was even shorter, but it was examined by one of us at about those intervals. The membrane had already ruptured at the end of this short time, if not, of course, we incised it. Then a very abundant sero-sanguinolent discharge commenced to pour out of the meatus to the extent of three or four ounces daily. If the patient would turn his head to one side, the upper ear would fill with this discharge all the way to the concha, which would also fill, in sometimes, half an hour: When he would turn, he would dump this concha full of discharge onto the pillow. All

three types of purulent otitis, the hemorrhagic, the slow and the fulminating were accompanied by more or less deafness and tinnitus, but these were often equally present in cases that had not middle ear inflammation.

Sensations of fullness and other subjective signs of closure of the tube by tumified membrane were sometimes present after the onset of the otitis. Many cases of both types also had a tenderness during the early stages, located in the soft tissues over the mastoid. This always subsided in a few days. Usually the patient had not noticed the early tinnitus or the early impairment of hearing. In the slow cases, pain was occasionally complained of by the patient at the onset, but if an otoscopic examination had been made every day it was noticed that the pain was preceded some hours by a congestion of the membrana tympani, first along the manubrium, later spreading to the periphery. In the fulminating cases there was often pain, and when present, it was severe at the outset, but subsided completely in a few hours. If the toxemia was great, pain was not complained of. In the fulminating class, the drum membrane, in many cases did not get a very intense red, for soon an exfoliation from its outer surface began, which gave it rather a grayish appearance, sometimes dark sometimes nearly white. Exfoliation from the deeper canal also often occurred. The inflammation became more intense, the canal and the mastoid became tender, the lymphatics near the ear sometimes swelled (though this usually occurred later) the membrane began to bulge and if not incised, burst usually in the posterior inferior quadrant. The upper and the posterior boundaries of the membrane would disappear so that the membrane would seem continuous with the canal walls in these regions. With the beginning of the discharge the maceration and exfoliation of the epithelial layer of the drum membrane and of the deeper canal wall would increase until it nearly filled the canal. Inspection would be impossible until after a thorough mopping of the parts. The discharge was serous, or, more frequently, sero-purulent, almost invariably sanguinolent, in the early stages; later becoming thick, creamy pus of a dirty, pale greenish color and without fetor unless there had been pre-typhoid chronic purulent otitis. In one case without previous ear disease it had a fecal odor.

The discharge in 22 cases out of 88 was purulent from the beginning though the pus was diluted with serum and mucus. In 66 cases it was serum tinged with blood and very copious in quantity, in some instances reaching probably two or three ounces daily. The quantity of discharge usually reached its maximum with a week by which time, it was thick, creamy pus. Then the quantity usually

began to diminish, and if the case were one that tended toward chronic otorrhea the discharge persisted in a very much diminished quantity. In the cases that later developed mastoid empyema, the discharge also grew less in quantity and persisted at the diminished rate and sometimes ceased altogether, due to obstruction.

Tenderness on Pressure over the mastoid was present in 23 of the 88 otitis cases in the first few days of the otitis. At first it was thought this was due to a periostitis from extension of the infection out behind the fibrous canal where we often see pus find its way in children. But the quick subsidence of this tenderness and the absence of swelling precluded periostitis.

The Temperature in both types if it had reached normal, would usually rise with the development of the otitis and subside with the rupture or incision of the drum membrane. Even in the cases of mastoid empyema it usually remained normal or nearly so, except in one case, where operation had been postponed for special reasons, until the pus burst through into the soft tissues of the neck.

Otorrhagia, in eight cases hemorrhagic blebs were noted on the external surface of the drum membrane, the accumulation of sanguinolent serum (sometimes almost blood alone) was evidently under the outer epithelial layer of the drum membrane, as the blebs readily burst when touched with a probe. In several of the cases the blebs extended beyond the periphery of the membrane raising the epithelial layer of the canal. In every case where the blebs were noted, a purulent middle ear inflammation developed later. Probably inflammation existed at the time, but pus formation came later. In two cases the middle ear, when evacuated by incising the bulging drum membrane, was found to be filled with the same fluid as the blebs. In one of them the fluid was also seen in the Eustachian orifice in the naso-pharynx. In one case of purpuric typhoid the eruption was seen upon the tympanic mucosa by inspection through a perforation enlarged by incision. It is not common to see the early discharges of an acute otitis media blood stained, but in these cases it is the rule. It is probably an oozing from a highly inflamed mucosa. In one case a genuine hemorrhage from the ear occurred. The patient, a man 29 years old, had an intestinal hemorrhage two days previously. Thick, dark blood was noticed dropping from the auricle to the pillow. It was not mixed with pus or catarrhal discharge, but seemed to be blood alone. Upon wiping the canal out a perforation was noticed in the membrane flaccida, through which the blood was pushing in a small bead, increasing in size until a drop was formed, and continuing to flow outward. The aural hemorrhage continued for two days as blood alone, then

began to gradually change to bloody pus, later to the usually grayish greenish, yellow pus unmixed with blood. As to the source of this hemorrhage it certainly came from the middle ear, as a probe freely entered the perforation. Whether it came from a vessel eroded by a typhoid ulcer or not can only be conjectured. Yet, as it was impeded and followed by a typical intestinal hemorrhage there might be grounds for believing that it was similar pathologically. It did not, as in the purpuric cases, seem to lack the clotting quality. It is to be regretted that the interior of the middle ear was not examined in this case by free incision of the membrane. In another case, however, where an incision of the drum membrane was necessary to allow of free drainage in a bulging unperforated membrana tympani, occasion was taken to encircle the entire drum membrane and elevate it as a flap to thoroughly examine the middle ear. An ulcer was discovered on the promontory, quite superficial. Later it became deeper and the membrane became more swollen and oedematous, until all landmarks were obliterated. At the end of three weeks, however, the discharge had ceased, the drum membrane had united all around the circular incision and the ear was practically well, though the hearing did not quite reach the normal. The linear shape of the ulcer was suggestive of thrombosis of a small vessel.

Deafness, to a greater or less degree was always present in the affected ears, but as it was always present in the unaffected ears to an almost equal extent, it was probable that the perceptive apparatus, including the sensorium, was not in condition to perceive delicate sounds, even if the conducting apparatus would transmit them. The hearing power was not easy to determine for many reasons. Hebetude, stupidity, delirium, unconsciousness, lack of an interpreter; these, and other things, narrowed down the hearing tests to 98 cases of typhoid fever. Of these, 48 (49%) could not hear a watch tick. Fifty-four (55.1%) could not hear a low voice at two feet.

Tinnitus was rather difficult to get statistics on for the reason given under deafness. In 20 cases of purulent otitis media that we were certain understood our meaning, 17 (85%) had tinnitus. Tubal symptoms, about which it would seem interesting to gather statistics were impossible of comprehension by our interpreters, to say nothing of getting it into the patient's disordered sensorium.

DIAGNOSIS.

The diagnosis of otitis media in typhoid fever, does not differ greatly from that of the same disease in other infections. Provided the ear is examined every day; but if one waits for the patient to

complain of the pain or tinnitus, the diagnosis will be made by seeing a copious ear discharge in about 50% of the cases. This refers to hospital cases.

The diagnosis between a primary acute purulent otitis media that has not been incised and drained, has become sub-acute, has involved the mastoid, and a typhoid fever with ear suppuration may not seem difficult, and is not, to the otologist, but the general practitioner will often experience difficulty, especially where clear histories cannot be obtained. Such a case complicated with pus foci elsewhere, where absorption is freer than in the ear and mastoid, may have a temperature chart, simulating typhoid fever closely. The Widal reaction will be of assistance.

PROGNOSIS.

As to Life, of 88 cases of purulent otitis media in typhoid fever none were fatal through any complication of the ear condition. Four died but of conditions remote from the ear; one of intestinal perforation, two of toxemia, one of intestinal hemorrhage. That death did not occur from the ear complications was due solely to the fact that all cases were watched, that free drainage through an ample perforation or incision was maintained, and that the mastoid involvements were cut short early. If free drainage be not maintained, erosion through the tympanic roof or elsewhere may put the patient's life in jeopardy. If, in the mastoid cases, operation be postponed too long, a large element of risk is introduced. In no other class of mastoid cases do we see more rapid tissue destruction. In very pneumatic mastoids the cell walls seemed to have almost melted away. Hence the prognosis is favorable, only in early operated cases. Of the otitis media purulenta cases, 31 (35.2%) recovered without a perforation. Twenty-six (29.5%) recovered with a perforation; sixteen (18.2%) were discharged with *otorrhea* because they refused operation, and in 15 (17%) the condition on discharge was not recorded. There was suppurative *mastoid involvement* in 26 cases out of the 88 (29%). *Tinnitus* was still present in about six out of 26 (23.1%) cases when discharged. It was especially bad in one case in which a radical operation had to be done. This case had a previous chronic *otorrhea*. Possibly he had tinnitus prior to his typhoid, though he denied it. *Deafness* was total and permanent in two cases, fortunately both unilateral. These two were suppurative involvement of the labyrinth secondary to the otitis media, really "panotitis." Excepting these two, no case of purulent otitis media, including the mastoid cases, were unable to hear low voices at two feet, and only four were unable to hear a loud ticking watch on contact. This means four out of 32 (12.5%) for on ac-

count of previous ear disease, independent of labyrinthine trouble, or inability to get a record of hearing on admission, many had to be excluded. The hearing was better in the early operated mastoid cases than in the later operated cases, and was better in the early operated cases than in the suppurative otitis cases that recovered without mastoid involvement.

Impairment of hearing was, in ten cases, associated with lowering of the upper tone limit and these were excluded. The duration of the otorrhea in the cases that recovered before leaving the hospital and without the mastoid operation, was three weeks in the shortest case, eighteen weeks in the longest. A complete cure resulted in all the cases in which the mastoid was opened. This included two cases with pre-typhoid chronic purulent otitis, in which a radical operation was done. It would be interesting to know just how many of the cases discharged with otorrhea who refused operation became chronic. Doubtless most of them did, though given instructions for the use of the boric acid douche, in their condition of life, it is probable they never carried out the instructions. The case books, both private and dispensary, of most otologists, contain few histories of ear trouble referred back to typhoid fever. Moos reports two, Bezold, 5; of the latter, two still discharged, one had a healed and a discharging ear, one case had normal ears; two of them showed darkened drum heads. One remembered an otorrhea ceasing 15 weeks after his typhoid fever.

TREATMENT.

Treatment would naturally divide itself into prophylactic and curative. The prevention of cases of fulminating type, if our opinion as to the thrombotic or embolic etiology be correct, we fear is beyond the skill of modern medicine. The prevention of the cases deemed infective would seem equally hopeless, if the process be due to blood-borne pyogenic organism or typhoid bacilli. If the purulent otitis be deemed primarily a direct infection by pyogenic bacteria, from the throat, there would seem to be ample room for prophylactic effort. Our investigations prove that infection probably enters not by the external canal, but by way of the tube. If this is the case the greatest efforts should be made to keep the air as free as possible from pyogenic organisms. All bedding, including mattresses and pillows should be fumigated as thoroughly after each patient (pus case or not) as after a case of smallpox.

Fumigation of the wards during which the patients are removed should be frequently done. The walls should be washed down with an antiseptic solution or painted, and the floors scraped and varnished. These and many other well known details ought to help. All

draughts should be avoided, though thorough ventilation must be maintained. The head should not be too low, as this would favor a flow to the mastoid antrum, thus interfering with the drainage and possibly favoring hypostasis in the tympanic mucosa. Demeurisse urges isolation in all purulent otitis cases, especially those complicating the acute infections. Bezold recommends removing stagnant secretions by swabbing the naso-pharynx with an antiseptic solution, followed by insufflation of boric acid. Locally, antiseptic agents, but more still, cleansing agents, must certainly be used in clearing the naso-pharynx and tube mouths. The nose had probably better be left alone. A post nasal douche would be more than usually dangerous. In all the prophylactic measures, one thing must be clearly borne in mind, namely, anything that excites or annoys the patient is a detriment to his general condition, so that we must be very sure that what we do is of unquestioned value. For this reason, Politzer's method of douching through the tube, by means of a catheter for cleansing suppurative ears, was not used after a single trial. It is a good measure, but was so fought against and dreamed and fretted about by the patient, that it was abandoned. The regular toilet of the mouth is agreeable to the patient and is certainly a good thing from the otologist's as well as the attending physician's viewpoint.

The ears of every typhoid fever patient after the second week should be examined, cerumen removed if present, and a daily watch kept on the drum membrane. When its vessels along the manubrium become visible, start at once the hot douche, antiseptic if you like, but hot. When the drum membrane reddens, it should be incised under aseptic precautions, without delay. If it prove but a myringitis, no harm will have been done, and usually it will be found to be the early stages of purulent median otitis.

The advantage of free drainage was shown in the six cases where the membrana tympani was circumcised and in five cases quartered. This though done for inspection, by the free drainage afforded evidently was a most efficient therapeutic measure, for the cases not only recovered from the otitis, but recovered without leaving a perforation. A fear that in the low recuperative power of typhoid the membrane might slough proved groundless. It would seem that occasionally one ought to succeed in preventing infection of the discharge when not already purulent, but our efforts to prevent purulency were utterly unavailing for the reason that the intricate recesses of the tympanum were already affected as mentioned under "*bacteriology*." Pus there was not, in many cases, but a few pus cells were visible microscopically, and worst of all, invariably pyogenic organisms. After the

incision the canal should always have a wick of iodoform gauze to facilitate the drainage. The gauze should be removed every hour or two and a thorough douching given and then it should be replaced.

Frequent douching is essential to keep the canal clean, to prevent pus from thickening on the canal walls, to prevent plugging of the perforation. That the antiseptic had no effect was clearly proven by the equal results from the use of salt solution. The heat and moisture probably had some inhibiting influence on the inflammation. Be the *modus operandi* what it may, certain it is, that mastoid empyema was much less frequent after systematic douching was instituted, though figures are not available.

In the early stages of otitis media in typhoid fever, the discharge was so profuse that all air infection is washed away in the flow; but as soon as the flow checks, air infection occurs. With a view of preventing this, the canals of a series of 20 cases were treated as a septic wound, packing with iodoform gauze immediately after an aseptic incision in the drum membrane. These cases became purulent just as soon as in a series of 20 cases treated simply by frequent douching showing that the purulency comes from within. The chemicals in the douche make little if any difference. We first used normal salt solution so as not to interfere with bacteriologic culture tests, but we soon found it quite as effective as any active germicide. The main thing is heat. The temperature should not be less than 110, and the douching must be frequent.

COMPLICATIONS.

The only complications were erysipelas and mastoid empyema. Erysipelas occurred in three cases. It was located on the face and scalp of all, but it seemed doubtful whether the infection was secondary to the ear condition. It occurred in a number of cases of typhoid fever uncomplicated by otitis, or any other lesion. It did not seem to influence the otitis in any way. Purulent otitis seemed to result from extension of erysipelas in one case.

Mastoid empyema is certainly growing more frequent as a complication of otitis in typhoid fever. Hengst found but one case of mastoiditis in 20 suppurative otitis cases complicating typhoid fever. Bezold found but one in 43 cases. But the older authorities never seem to have found mastoid empyema in purulent otitis from any cause as frequently as it is found today. Mastoid empyema occurred in 26 out of 88 (29.5%) of the purulent otitis media cases. Mastoid tenderness occurred without pus formation in 31% of the cases.

This appeared at the outset of the malady, and always disap-

peared, in some cases not re-appearing, and in others returning with the pus formation in the mastoid cells. The large percentage of mastoid complications in the purulent otitis cases, is due probably to three causes, virulence of the infection, lowered resistance, and the almost constant dorsal decubitis which favors the collection of pus in the antrum. This is specially true of cases where on account of intestinal hemorrhage or other reason, the pillow is removed and the foot of the bed is elevated. Gravity has no opposition on account of the absence of cilia in the mucosa of the aditus ad antrum.

It is a remarkable observation that every purulent otitis case so treated (by elevation of the foot of the bed) that did not die too soon (of conditions remote from the ear) developed a mastoid empyema. There were four of these cases, one unilateral, and three bilateral. All the bilateral cases developed bilateral mastoid empyemata. The low resistance was shown on one case, where, after cleaning out a mastoid down to healthy bone, the first dressing revealed large patches of bone, dead because it had not sufficient vitality to resist invasion. There were no peculiar features about the mastoid cases except the exceedingly rapid destruction of tissue and the fact that the temperature was absolutely normal for a week or more, before the operation, in 14 out of 26 (53.8%) cases. Evidently there is little power of absorption in the mastoid portion of the temporal bone. When the pus breaks through into the soft tissues of the neck, as it was allowed to do in one case, the usual pus chart appeared. In six cases out of 26 (23.1%) the temperature ranged to 99 or 100 and back to normal. In five out of 26 (19.2%) the range was to 104 and back to 90 or 100, but in these cases we could not exclude the possibility of its being due to pus in other locations or to a typhoid fever reinfection. The authors hope that it will not be considered boastful when the statement is made that of the 26 cases in which the mastoid was opened, pus was found in every instance; not only in the antrum but in the mastoid cells. This required careful watching. Had there been any doubt in our minds as to the presence of pus in the mastoid, in any case, we should certainly have operated anyway.

But to the otologist who watches a case every day, there is no difficulty in saying when pus begins to form. All save one were opened before pus had bursted through the cortex. In this one case operation had been postponed for a special reason for two weeks beyond the time when operation was deemed advisable.

DISEASES OF THE MAXILLARY ANTRUM, THEIR DIAGNOSIS AND TREATMENT.

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The largest, most dependent from above downwards, most frequently affected, and, all things considered, most readily treated of all the accessory sinuses, is the maxillary sinus the antrum of Highmore.

There is abundant literature relating to this and other sinuses, and the presentation of this brief paper has its only excuse in its attempt to elucidate a few of the points in which differences of opinion have arisen and an attempt to clearly present the diagnosis and treatment of these affections as they are practiced at the present time.

While the antrum of Highmore is generally the largest of the sinuses, there are a number of anomalous conditions in which the antrum is very small and again in which the antrum encroaches so far up that its upper border reaches the floor of the orbit. The antrum of Highmore exists as such in foetal life although one observer maintains that it is not present until the fourth year of life.

As a general rule the antrum is one large cavity, but occasionally it is divided by septa reaching often to the upper wall of the antrum. These septa are usually very thin and readily broken down, but occasionally the bony wall that forms them is hard as adamant. The principal diseased condition of the antra are inflammatory and may be those of simple inflammation, conditions of serous exudate, of pus, and of all grades of degeneration of the mucous membrane.

ETIOLOGY.

Among the principal causes of diseased antra are, infection having as its origin an acute form of influenza, infection from neighboring inflammation and infectious conditions such as diphtheria, scarlet fever, etc.; extensions of purulent conditions from the alveoli; external injuries and constitutional disease.

While there are no reliable statistics on the subject it occurs more frequently in males, and by far the greater number are adults. Its occurrence in children is so rare that in an article on empyema of the

antrum in young children I was able to gather but ten cases altogether, of which mine was one, in the world's literature.

In fact so infrequent is the occurrence of this affection in young children that one writer attempted to prove that there was no antrum in early life and said that these diseased conditions were simply caries.

The symptoms in the acute cases are mainly those of pain directly over the antrum extending sometimes to the frontal region; this pain is of a persistent gnawing character, is constant and at times exceedingly severe. Unless relief is obtained a muco-purulent discharge appears on the same side without, as a rule, relieving the pain. There is no periodicity to the pains although there are times when there is a cessation which is soon followed by recurrence of the pain.

Another class of case gives a history of some form of acute rhinitis followed by a muco-purulent discharge; the discharge is on the side affected but it must be borne in mind that both antra may be simultaneously affected.

Diagnosis. In the case where the history is apparent and the symptoms clearly presented, the diagnosis is very easy. In the more chronic conditions however, the diagnosis is by no means easy and sometimes a rare degree of diagnostic skill is required, every means at our command being requisite to reach the desired end. In a suspected case of antrum disease the nose is first examined and if, as is very apt to exist, the nasal mucosa are swollen, an application of a solution of cocaine becomes necessary.

After a wait of a very few minutes the interior of the nose can be inspected and search is made for the presence of pus. A single drop of pus may be found hanging from the under surface of the middle turbinate, and this is the first clew. The patient is then directed to bend the body forward and the head downwards for a few seconds and then sit upright and pus will often be found at the site of the original drop.

At times, however, there is no evidence of pus. In such a suspected case, finding the interior of the nose normal, palpation over the external surface of the antrum with the index finger or thumb in the patient's mouth may elicit pain.

Trans-illumination in a fully darkened room may show a distinct area of darkness. This latter method is the most uncertain of all our methods and while it may be corroborative it is by no means a final or decisive test.

All the examinations made hitherto may still be negative and here the instruments devised by Hajek or preferably a much stronger one devised by Abraham of New York City comes in use. The instru-

ments mentioned are a troccarcanula which is placed in the floor of the nose about an inch from the external meatus and plunged through the nasal wall of the antrum into the cavity with a syringe attachment for aspiration. The contents of the antrum are thus ascertained. The writer has made a number of investigations with the fluoroscope in the hope that the X-Ray might help in diagnosing diseased conditions in the bone cavity. Thus far nothing tangible has presented as a result.

Treatment. For acute disease of the antrum, nothing is so valuable as the washing out of the antrum through the natural opening.

Some misunderstanding has arisen regarding statements made by myself in reference to the possibility of cleansing the antrum of Highmore through the natural opening.

If we bear in mind the position usually maintained by the patient in an upright posture and at the same time the position of the antrum, we will note that the floor of the antrum is on a line normally with the ala of the nose. The natural opening, however, lies directly under the middle turbinate and enters into the antrum in its upper portion.

It stands to reason, therefore, that drainage through this opening would only affect such portions of the cavity as lie above the opening and hence the statement made that given copious pus discharge from the antrum of Highmore, drainage through the natural openings becomes impossible and that irrigation alone cannot be of lasting benefit. In acute cases, however, thick pus has not formed and the cleansing may be done through the natural opening.

It is all important that washing out of the cavity should be with a steady stream and a copious supply of fluid.

A solution of $\frac{1}{2}$ of 1% Lysol has acted best in my hands and I have been able to irrigate freely, keeping a constant control on the pressure required, alternating or following the irrigation as the case may be by forcing air through the same tube that is used for washing purposes.

This has been done by the use of a very ingenious device originated by Dr. S. Yankauer of New York City, my assistant at the New York Eye and Ear Infirmary. The wash bottle is placed alongside the patient and when the tube has been introduced in the natural opening the simple turning of a cock is all that is required.

The apparatus which I presented before the section on Laryngology of the New York Academy of Medicine is thus described. (Fig. 1.)

The apparatus consists of a bottle having a metal cap which carries a pressure gauge, and inlet and an outlet tube. The inlet

tube fits the cut-off of the compressed air outfit and is closed by a stop-cock. The outflow tube reaches to the bottom of the bottle and has a two-way stop-cock, to close the tube and to change its contents from fluid to air. The latter is used to empty and dry the sinus after irrigation.

The bottle, which holds one quart, is filled with a pint or less of fluid, and compressed air let in until the gauge registers 20 pounds. The in-let stop-cock is closed and the apparatus disconnected. The strength of the stream can be regulated by the stop-cock at the out-flow tube. As the pressure actually used at the extremity of the canula is less than 5 pounds, the bottle will empty itself with a practically constant flow.

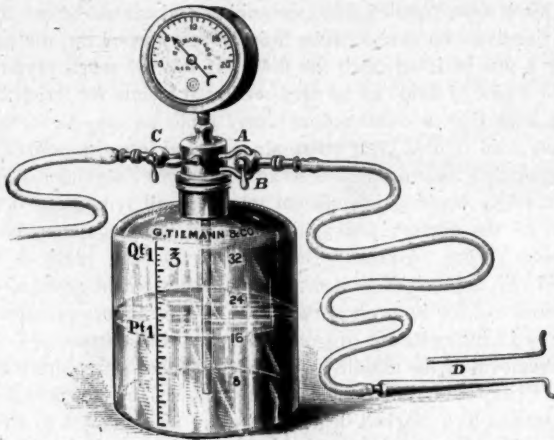


Fig. No. 1.

If a larger quantity of fluid is to be used, the cut-off is attached to the inlet tube, the cut-off and stop-cock left open, and the pressure adjusted by means of the regulator of the compressed air outfit.

By means of this apparatus the pressure used to irrigate each accessory cavity can be measured. The strength of the stream can be varied from a mere dripping to a powerful jet, and it is always under absolute and immediate control.

To irrigate the antrum, Messrs. Tiemann & Company have made for me two virgin silver tubes which taper towards the distal end. The proximal end is fitted with a round extremity and grooved, thus enabling the rubber tubing to fit snugly.

The distal end has a double curve which may be likened to the double curved needles used in cleft palate operations and are so curved as to be useful for the right or left antrum. This bending is readily done as the material is malleable but on account of the danger of breaking from much bending I prefer to have two tubes already bent, one for each antrum.

A small amount of cocaine renders the nose less susceptible to irritation and the introduction of the tube is thereby facilitated.

The orifice being directly under the middle turbinate the tube must be well introduced to that bone before the opening is sought. When so introduced the tip of the tube enters readily into the opening, which fact may be ascertained by its being hooked in and self retaining.

All air is first expelled from the tubing and canula before the introduction into the cavity. The fluid is then turned on, the patient having a pus basin to catch the flow. If not too much pressure is exerted a pint of fluid can be used readily at a time for irrigation.

The irrigation is continued as many times as may be necessary until the fluid returns clear; then air is forced into the cavity. The temperature of the fluid used is about 90 degrees Fahrenheit. Sometimes a single washing is sufficient to relieve all symptoms of acute disease of the antrum and again repeated washings may become necessary. Very frequently the middle turbinate, really a large ethmoid cell, is much distended and encroaches on the septum. The indications are for its prompt removal and the scissors presented by Holmes of Cincinnati are of great value for this purpose.

The removal of the middle turbinate establishes a free drain at the natural orifice and this alone is often followed by amelioration of all symptoms to a marked degree. We are also enabled to irrigate more readily when this has been done. For the more chronic conditions irrigation is a slow and tedious process and something of a radical nature becomes necessary. Intra-nasally the wall of the antra may be broken down by the use of the electro-trephine with the burr directed downward and outward beneath the middle turbinate or upward and outward on a line with the inferior. The radical mode of procedure, however, consists in operating through the canine fossa. The complete operation is known as the Caldwell-Luc operation and consists of opening the canine fossa and then breaking down the nasal wall making through drainage. Another operation is the opening of the canine fossa and inserting a rubber tube for drainage. Still another form is the extraction of a tooth and extension of the cavity of the alveolus into the antrum.

The modes of operation are so well known that I shall not detail them here. I may, however, call attention to a device for the retraction of the cheek which I have found very useful in operating and subsequent dressing. (Fig. 2.) It is shaped like a perineal retractor and its long handle enables the patient to keep the cheek well retracted in the subsequent dressings or in operating when held by an assistant. (See accompanying illustration.)

That the diagnosis of disease of the antrum of Highmore is not always easy of accomplishment is evidenced by the brief history of three cases here presented.

In all of these cases the patients had consulted competent rhinologists—one of them indeed had traveled to the principal European cities in the hope of obtaining relief.

In none of them was the diagnosis of antrum disease made, until made by myself, and all recovered promptly after operation.

Case I. Male, aged 55, referred to me by a neurologist whom he had consulted after having been treated for many weeks for neural-



Fig. No. 2.

gia. The neurologist suspected antrum disease which I promptly confirmed. Operation the next day through the canine fossa, discharge of muco pus, prompt cessation of pain, wound closed in one month, no recurrence.

Case II. Female, aged 40, severe facial pains lasting for three years in which time she consulted prominent physicians in this country and Germany. By the advice of her family physician, she consulted the neurologist who had referred case No. 1 to me. I was asked to see the case in consultation with both gentlemen. I found much tenderness over the antrum, a distinctly dark spot in transillumination, no pus in the nose, but a fistulous opening above the first incisor through which pus was streaming and had been pouring all the time. I was able to elicit the fact that when pus flowed freely from this fistulous opening the pains diminished, while when it was closed the pains became unbearable. A very fine probe entered the fistulous opening, curved along the right and touched the bony covering of the antrum on that left side. My diagnosis was suppuration in the antrum of Highmore whose occasional outlet was through this fistulous opening.

This was concurred in by the gentlemen present and the following day, in their presence, under gas and ether anæsthesia, I operated.

Portions of the antrum wall were eroded and a free flow of pus followed the opening. The patient made a good recovery from the operation, a drainage tube was subsequently inserted, and two months later the wound was allowed to close. From the time of operation there have been no pains, although five years have elapsed and I have had occasion to see the patient from time to time.

Case III. Female, aged 32, of neurotic temperament was referred to me by her physician whom she had consulted the day previous. Her previous history is interesting from the fact that she had been suffering from severe facial pain for over two years and had been treated by her physician in the southwestern part of this country. She had gone to Sanitaria with only temporary benefit. She had consulted a distinguished rhinologist in Chicago and the eventual diagnosis in each case was that she was malingering. The result of all this were strained relations at home and much unhappiness, the patient making many brave efforts to appear well, but always eventually compelled to yield to her sufferings. An examination led to the diagnosis of disease of the antrum of Highmore, based on the following conditions:

Tenderness on pressure over the left antrum most markedly acute about its center. A dark spot showed on trans-illumination. On the following day, under ether anaesthesia and in the presence of her own physician who had accompanied her from her home and of the neurologist who referred her to me and with the assistance of the house staff at the New York Eye and Ear Infirmary I operated in that institution on the left antrum.

The operation was performed by the route of the canine fossa, and as soon as the periosteum was pushed back the exterior surface of the bone over the antrum was found to be carious from above downwards being about 1-16 of an inch in width and fully 1 inch in length. The carious edges were then removed, the antrum washed out and the cavity packed. In one week she left the Infirmary to enter a sanitarium to be treated for her wretched nervous condition. From this institution she was discharged as cured in due time and there has been no recurrence.

The following conclusions may be reached as a result of the study of these affections.

First. The diagnosis is readily made when all classical symptoms are present.

Second. The absence of pus in the nose does not exclude antral disease.

Third. Pain, long lasting, directly over the antrum should be an added factor in the diagnosis.

Fourth. Trans-illumination test is corroborative.

Fifth. The washing out by means of the natural opening is difficult of accomplishment because of the lack of proper drainage and is applicable to the acute conditions only.

Sixth. Irrigation by means of a properly made wash bottle whose force can be readily controlled is of very great help in the treatment.

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